DIESEL PROGRESS

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MARCH, 1945 FIVE DOLLARS PER YEAR—FIFTY CENTS PER COPY

DIESEL PROGRESS, for March, 1945. Volume XI, Number 3. DIESEL PROGRESS is published monthly by Diesel Engines, Inc., 2 West Forty-fifth St., New York 19, N. Y. Rex. W. Wadman, President. Acceptance under the Act of June 5, 1943, at East Stroudsburg, Pa., authorized March 27, 1940. Subscription rates: $5.00 per year, single copy, 50c.

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Art Director

MARCH CONTENTS

RONT COVER ILLUSTRATION: Wow! Six, 5400 .P. General Motors Diesel freight locomotives, like e one pictured, operating on the Erie, between arion, Ohio, and Meadville, Pennsylvania, the tough- t territory on its mainline, have doubled tonnage per ain and speeded handling of vital war material.

TABLE OF CONTENTS ILLUSTRATION: Veterans of three major European invasions, LCI's arriving home after an Atlantic crossing. Manned by U. S. Coast Guard and powered "Quads" comprised of 4 Diesels of the "71" series manufactured by Detroit Diesel Division of General Motors.

DIESEL PROGRESS for March, 1945, Vol. XI, No. 3. Published monthly by Diesel Engines, Inc., 2 West 45th Street, New York 19. N. Y. Tel. MUrray Hill 2-7333. Subscription rates are $5.00 for U.S.A. and possessions. All other countries $7.50 per year. Subscriptions may be paid the London office at £1-17s per year.

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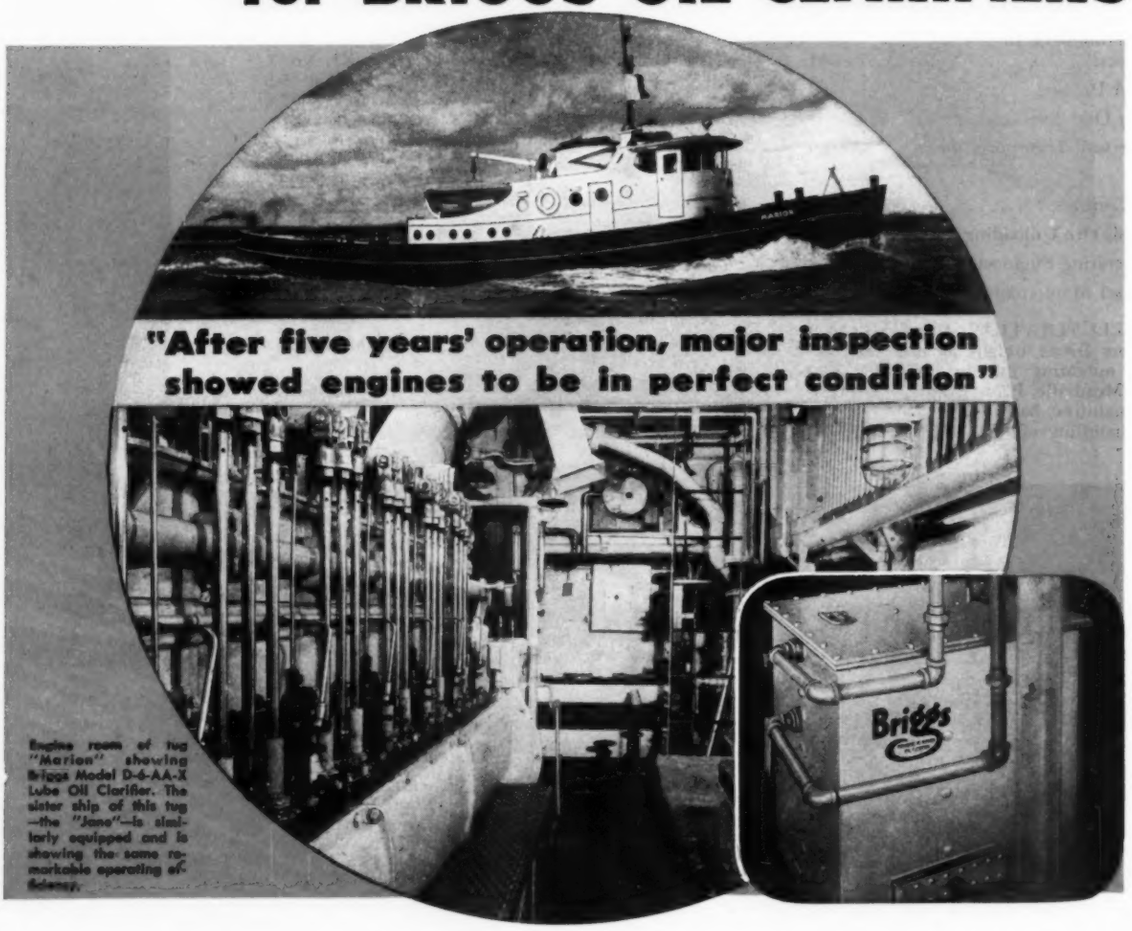

Engine room of tug "Marion" showing Briggs Model D-6-AA-X Lube Oil Clarifier. The sister ship of this tug —the "Jane"—is similarly equipped and is showing the same remarkable operating efficiency.

That is the statement made by R. J. Ponds, Marine Superintendent of the Curtis Bay Towing Company . . . operators of the Great Silver Fleet of tugs that serve busy Baltimore harbor.

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The Briggs distributor in your locality will tell you WHY AND HOW Briggs Oil Clarifiers will benefit you. Call him—or write manufacturer for literature.

OPERATING DATA ON TUG "MARION"

ENGINE — Enterprise Diesel, 300 HP at 300 RPM
LUBE OIL—Straight mineral
OPERATION—120 hours per week
LOAD—90%
OIL CONSUMPTION—½ gallon a day
OIL CHANGED—1600 hours
CLARIFIER REFILLS CHANGED —1600 hours

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RAILROADING DIESEL SOLDIERS DO GRAND JOB IN MEDITERRANEAN

By SERGEANT JOHN L. MURPHY

Editor's Note: We break precedent to publish this splendid article without illustrations because the job our fighting men are doing with Diesels under battle conditions is here vividly told, also because the War Department says, "Sorry, no pictures."

ALLIED Force Headquarters, Italy—Railroad men generally don't repair boats or operate supply depots or fix German airplanes. That is, most railroad men don't; but the Army's 760th Diesel Repair Battalion got into a few spots during the fighting of the war in the Mediterranean that changed all that. The 760th was organized in July 1942 to maintain Army Diesel-electric locomotives and, according to indications, the outfit could do the job well. Many of its men had been railroaders in civilian life, others were machinists, some were Diesel engineers.

Nothing much out of the ordinary happened to the 760th while it stayed in the United States. The men took basic training. They marched and crawled and fired on the rifle range, wondering all the time how long it would be before they could chuck their field manuals into the waste basket and go to work on an Army railroad.

Finally, in the fall of 1942, they boarded a ship and sailed—destination, of course, unknown. When they arrived at the port of debarkation in November, they found they were in Tewfik, Egypt, and glad of it since the crossing had been by the long route around the Cape of Good Hope.

"We were on our way to Cairo," related Staff Sergeant Joe Bielinski of Milwaukee, Wisconsin, "but that damned Egyptian train rode like it was on its way to hell. About five miles from our desination, the train went off the tracks and some of the guys squawked, but I wasn't sorry. I got seasick on the boat and stayed that way all the time I was on the train. The five mile walk cured me."

It seems that derailing on their first train ride overseas was only the beginning. Parts of the outfit have been on and off the track so often since that the 760th has become perhaps the most versatile battalion overseas. Within a month after the outfit landed in Egypt, it had spread out to Syria, Palestine and Libya.

The first detachment to leave Cairo was led by Technical Sergeant Dean Kiesel, a Diesel mechanic from Portland, Oregon. Men on his detail went to Kantara, Egypt, where they were to unload the first American Diesel-electric locomotives to arrive overseas. "I don't think any of us ever had any training in how to unload locomotives from ships," Sergeant Kiesel said, "but there they were and there we were and the job got done. The engines were uncrated, put together and driven away."

None of the group had ever engineered a Diesel-electric locomotive but that constituted only a small obstacle. Although, according to civilian standards based on seniority, it takes the average man 20 years to become an engineer, these men had no choice but to learn in three hours.

"We had to get the engines off the docks and there wasn't anyone else around to do the job," explained Sergeant Kiesel. "An English engineer showed us the fundamentals."

Everything went well for the first few days. The locomotives were unloaded and driven to the local railroad yards where Staff Sergeant Harold Adams of Naperville, Illinois and his crew began cutting them down to fit Egyptian tunnels. They wouldn't go through because they came equipped with considerable armor plate and were a little too massive for the Egyptian State Railway.

"We didn't have a bit of trouble until the day when the rails leading into the shop got covered with oil," Sergeant Adams declared. "After that we had to build a new shop because one of the guys put the brakes on while he was bringing in an engine and knocked the build ing down." Another group under Staff Sergeant Charles Crawford of Paoli, Pennsylvania, went to Beirut, Syria, where they helped to operate and maintain the Heifa-Beirut-Tripoli Railroad. They arrived just in time to get a ringside seat at the war in that area.

"We had to go through Beirut on our way to work every day," Sergeant Crawford said, "right through the front lines. When we were riding towards town in the morning we could hear gun fire but every time we got there everything would be quiet. They considered it a family squabble, I guess. When we started to go through, they'd call the war off and wave at us to hurry. We did like they said, went right across 'No-Man's Land' and out the other side of town. Then we'd hear the firing begin again."

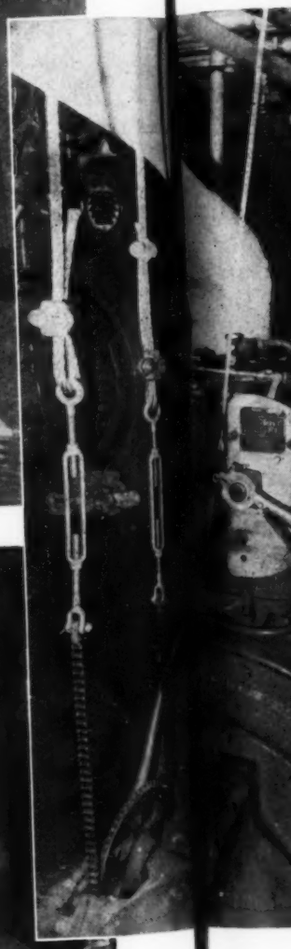
One of the favorite pastimes of the men stationed in Syria was teaching South African railroaders how to use American slang. The South Africans hit it off well with the Yanks, attracted by the informality of their new-found friends. "They always used to refer to engineers as engine drivers," Adams said. "Now they're hoggers. The conductors down there are also grateful—they don't have to worry about being such a fancy thing as a train guard but are simply conductors."

The railroad business in the Middle-East boomed but there just weren't enough railroads to keep the 760th busy. Boats also have Diesel engines and these men were Diesel mechanics and machinists so some of them were sent to the Port of Suez to maintain and repair boats which plied the Suez Canal.

"None of us had ever worked on marine engines before but that didn't bother us much," said Private First Class Fred Miller of Cincinnati, Ohio. "The trouble came when they tried to make sailors out of us. We fixed the Diesels and then they insisted we take them out in the bay for a try-out. Only sunk one 45 foot launch on the rocks, though. We did pretty well, considering everything."

By this time the 760th had men in Syria, Palestine and Egypt and the next contingent was to go to Libya. The British Eighth Army fighting Rommel's Afrika Corps and the American Ninth Airforce had to have a supply depot —a technical undertaking of no mean proportion—at Gambut and Technical Sergeant Warren Briggs of Georgetown, Delaware, got the detail. "Evidently they needed us at Gambut pretty badly," Sergeant Briggs explained, "because at two o'clock in the afternoon we were told to get ready for the trip from Cairo and we were on an airplane at four. We didn't worry about whether we could run a supply depot because we didn't have time to think about it until three months later," Briggs said.

. . . . *And now please turn to page 78* . . . .



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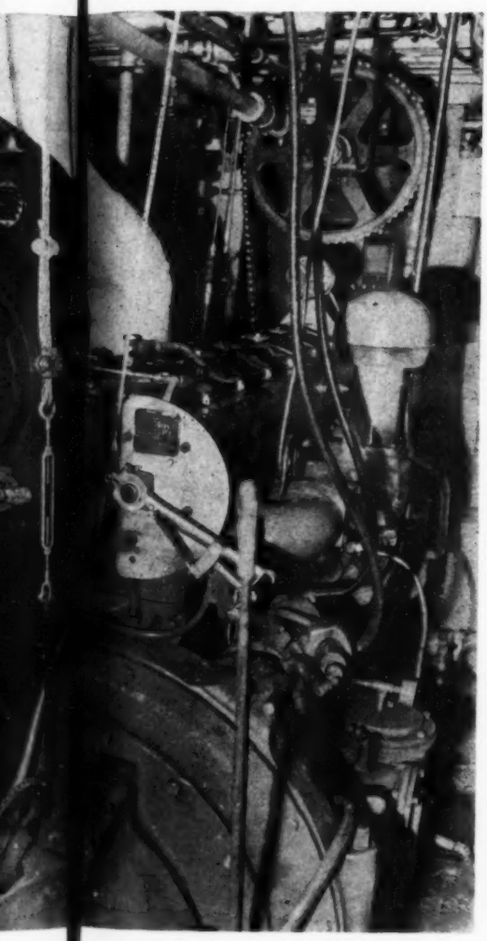
SMALL CLIPPERS POPULAR IN POST-WAR FLEET

By JIM MEDFORD



Upper left: The "Charlotte," short-waisted, but every inch a tuna clipper, on trial run.

Above: Closeup of the "Charlotte's" main propulsion engine, a six-cylinder, 150 hp. Murphy Diesel.

Left: Engine room view showing the Murphy main Diesel, left, and one of two Caterpillar Diesel-electric auxiliary units, right.

WITH fishing boat tonnage soon to reach the pre-war mark on the Pacific Coast, according to a recent survey of construction; in numbers, the smaller tuna clipper is holding her own. The latest to take the water is the 65-ft. *Charlotte* constructed by Hodgson-Greene-Haldeman at Long Beach, California, from designs by the yard's naval architect, Arthur DeFever.

The vessel's profile shows a short-waisted younger sister of the long-range, high-powered clipper, but nevertheless she'll stow under refrigeration 70 tons of fish, better than a ton per foot of length. Built for C. E. Mead and Dumm Bros., she has a beam of 18 ft., a molded depth of 9 ft. amidships, has accommodations for eight men in the forepeak on the main deck where the combination galley and messroom is also located.

On the after deck are two insulated steel bait boxes with refrigeration for fish on the return trip home. The one large hold below deck is divided into twelve sections by portable bin-boards. Refrigeration is by a Baker machine, 3½-in. bore and 3½-in. stroke, driven with V-belts from Fairbanks-Morse 10 hp. electric motor.

The main Diesel is a Murphy, a six cylinder, four cycle, 5¾-in. bore and 6½-in. stroke, 150 hp. at 1200 rpm. marine engine with sailing clutch and Joes 3:1 reduction gear to a 3⅝-in. bronze shaft turning a 15½ in. three-bladed wheel. The engine was supplied by Johnson Specialty Co., Wilmington, Southern California distributors for Murphy Diesels.

Starting is by means of 32-volt battery system and all controls are centered in one lever mounted on quadrant at after end of engine head. Engine clutch is operated by pilot house control through flexible wire rope leads equipped with turnbuckles for tension adjustment. Speed control 200 rpm. to 1200 rpm. is by means of a Servo-type hydraulic governor built into engine.

Fuel injection is through plunger-type Murphy unit injectors, the nozzle having six openings at a 15-degree angle for fuel atomization in the open combustion chambers. The injectors require no adjustment and it is possible to replace any injector in short time without disturbing the fuel lines.

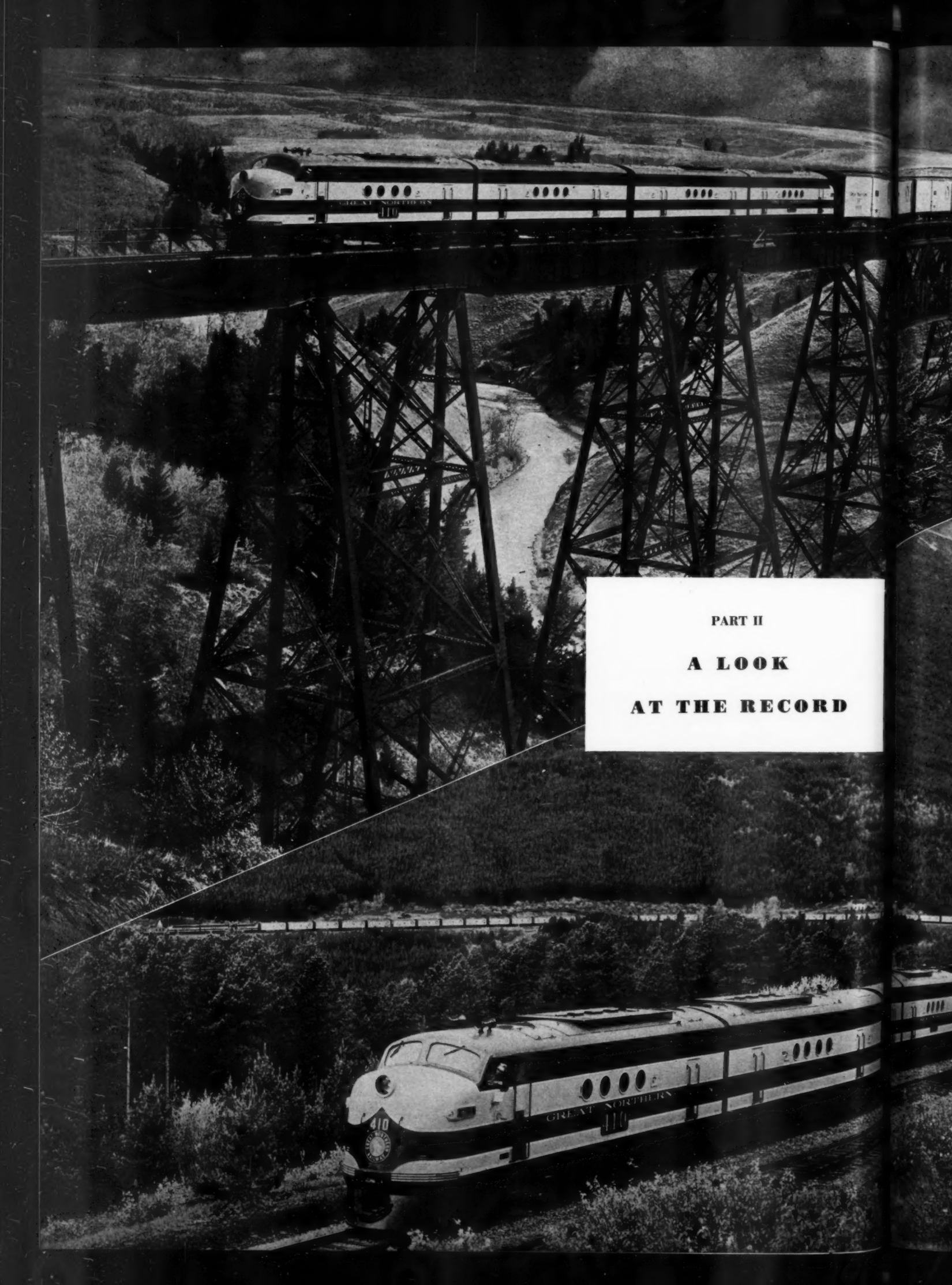
The Murphy Diesel features smaller valves, paired for exhaust and intake and having removable valve seats and double valve springs with an overall cup shaped tappet of hardened steel for the removal of all side thrust from the valve stem. These valve tappets also serve to prevent excessive lubrication of valve stems and guides. All guides are of bronze and removable. The camshafts are steel forgings carburized, hardened and ground, mounted in copper-lead lined, steel backed bushings in the camshaft housing atop the cylinder head.

The crankshafts are heat-treated steel drop forgings, machined and Tocco process hardened. Statically and dynamically balanced, the shaft is supported in seven bearings of 4-inch diameter. Bearings are of copper-lead alloy permanently brazed to the steel backing. The con-rod bearings are of same material and construction as the main bearing shells. Pistons are oil-cooled and cylinder sleeves are of the wet type.

Cooling of engine is by high velocity circulation in excess of 2600 feet per minute around each valve seat assuring proper temperature with closed system using heat exchanger. This means only a few degrees of temperature difference between inlet and outlet ports relieving engine of thermal stresses due to excessive differences in heat range of coolant.

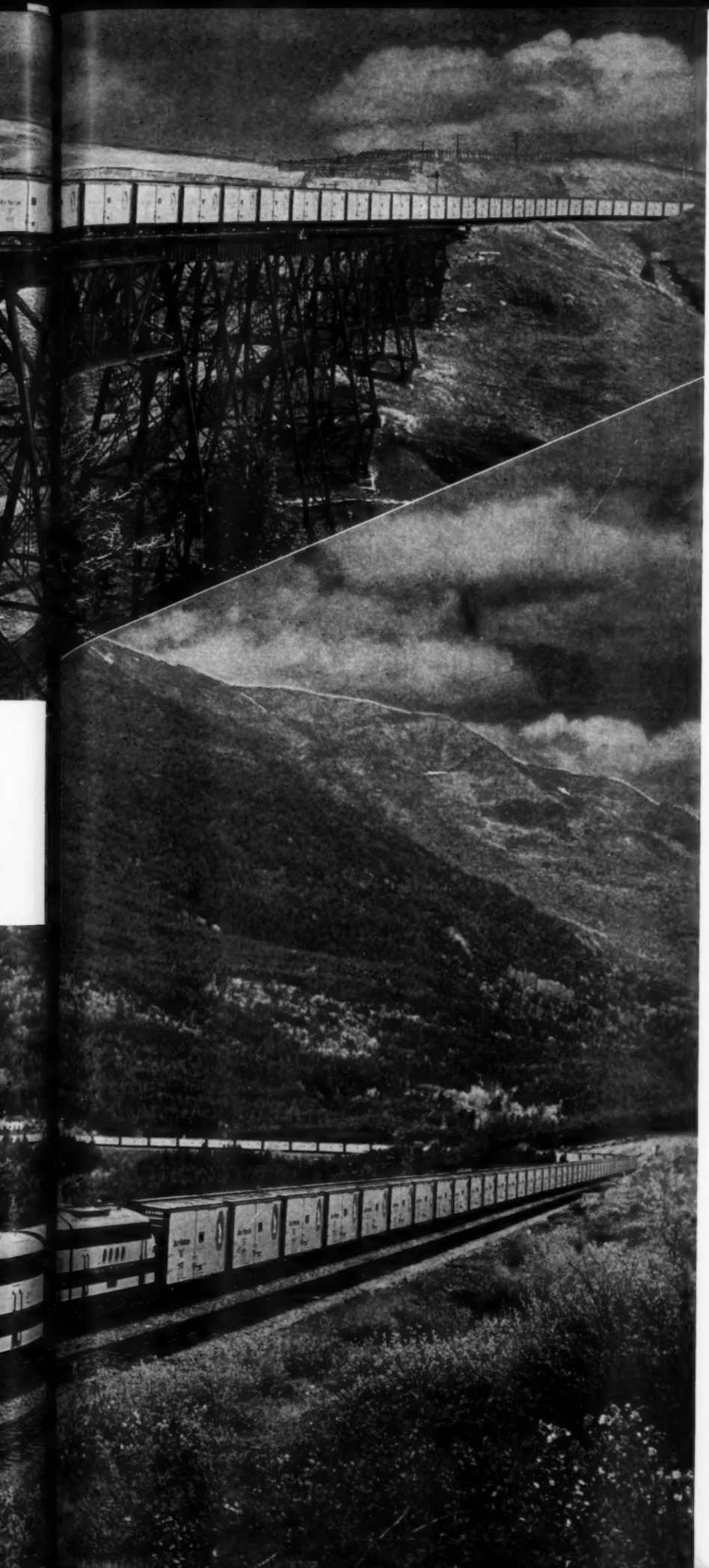
The auxiliaries are a pair of Caterpillar 25 hp., 15 kw. generator sets with gasoline engine starting units. These units provide energy for all lighting and refrigeration in addition to the 6-in. bait pumps.

Additional equipment includes: Fulton safety controls, Burgess intake air filter, Kittrell exhaust silencer, Briggs fuel and lube filters, Exide batteries, Crane water valves and Fairbanks-Morse electric motors.



PART II

A LOOK AT THE RECORD



GREAT NORTHERN ROLLS UP 200,000 MAINLINE DIESEL MILES PER MONTH

By CHARLES F. A. MANN

EDITOR'S NOTE: *Subsequent to the tabulation information for this article, the Great Northern has added 9 more Diesel switchers to its fleet, making a total of 52 now operated throughout the System.*

JULY 1944 was a peak month for the company. Everything on wheels rolled. The war stockpile required endless traffic movement and ore was moving down the Mesabi Range at peak pace. Exports for Lend-Lease from the North Pacific were high. Summer in the farm belt was a busy time. New 5400's were being added at the rate of one every three weeks, and 9 were already on the line. The Walton Helper nearly busted itself by trying to keep pace with both passenger and freight helper moves, a job ordinarily one of freight moves—passenger trains usually being hauled by steam engines geared to their own daily rhythms.

Fortunately, due to the helpful cooperation of Motive Power Department officials, we can present a complete, graphic statistical picture of the entire month, for the entire railroad.

The July, 1944 Operating Record

(All Divisions)

COAL & OIL LOCOMOTIVE PERFORMANCE

Miles run, freight	1,180,402
Miles run, passenger	617,070
(Other, including switchers)	387,799

Total miles run: 2,185,271 locomotive miles

Gross ton miles 3,167,334,416

which means 3.16 billion tons moved one mile.

ELECTRIFIED ZONE (WASHINGTON) PERFORMANCE

Miles run, freight	45,212
Miles run, passenger	25,882
Miles run, total	71,094
Gross ton miles	41,537,603

DIESEL LOCOMOTIVE PERFORMANCE

Miles run, freight	126,437
Miles run, passenger	67,281
(Others, including switchers)	185,343
Gross ton miles	350,880,126

KALISPELL DIVISION NOTES

It is interesting to observe that on this July performance record, 9 of the 5400 hp. Diesels piled up 311,888,467 of the total gross ton miles, which together with the lone 4050 hp. 3-unit Walton-Summit Diesel helper piled up 315,527,382 gross ton miles, while a fleet of big mallets nearly twice as large, piled up 335,729,089 gross ton miles, or scarcely half as much per locomotive as did the comparatively small fleet of Diesel locomotives. The twin Gopher Diesels accounted for almost 18,100,000 gross ton miles (Diesel) while the Butte 2700 hp. Diesel freighter turned out just under 10,800,000 gross ton miles. Which indicates that nine 5400's; one 2700 and the 4050 hp. Diesel helper all working in Montana did 90% of the Diesel ton-miles in that month for the whole system!

The Great Northern moved almost four billion gross ton miles in the single month of July.

Railroads contemplating electrification vs. Dieselization will be interested to observe from the record, what a company has done with electrification in the way of costs. The case of the Great Northern, where some millions of acres of land visible from or traversed by its rails isn't worth 15 cents per acre, contrasted by a huge chunk of the Mesabi Range worth 15 cents per cubic foot, brings into sharper focus some practical results accomplished by a far-flung railroad.

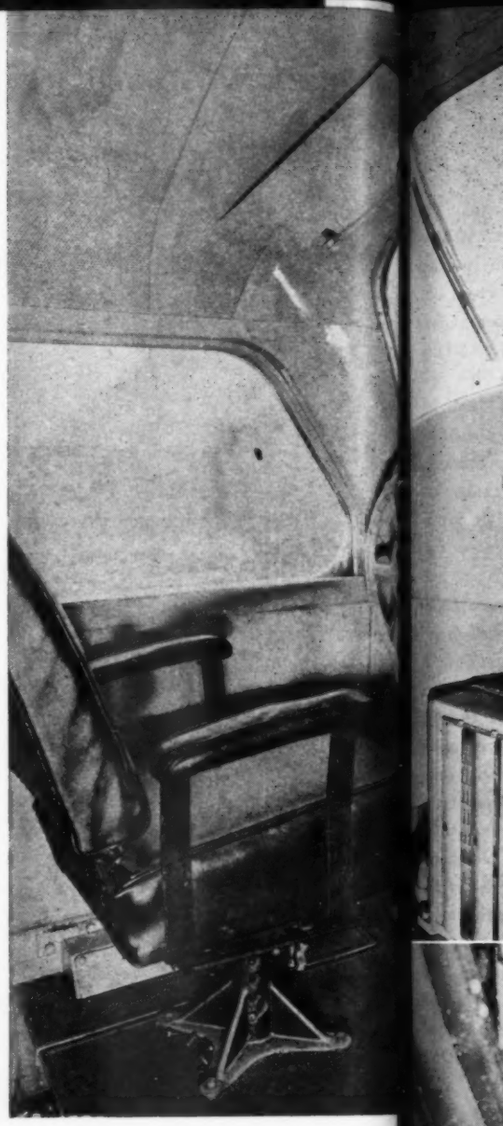
The Cascade electrified zone, a segment of the Spokane Division, with 2.2 grades, and the same standard 5,000 ton trains as operated on the Kalispell Division with Diesel, turns up an average cost for electricity, (fuel) of 36.37¢ per freight locomotive mile. Turning back to the 5400 hp. Diesels with the 1.8% grades and same load, the fleet of 9 averaged out 37.62¢ per locomotive mile for fuel oil, or 1¼¢ per mile more than the so-called "cheap" hydroelectric power cost for "white" fuel. Again, the average cost per mile for fuel, repairs, engine house, lubricants and supplies totalled 67.86¢ per locomotive mile for the Diesels, as against 60.33¢ per mile on a comparable basis for electric operation. And this, mind you, must be equated for regenerative electric braking, cost of overhead trolley and transmission facilities, rail bonding, etc. and added to the electric locomotive investment to bring it into comparable line with Diesel overall investment costs. Electric operation has its merits, but statistically, it is weak alongside Diesel, especially when traffic diminishes and the standby costs for power keep right on. If you don't believe it, ask the Great Northern. (Crew's wages are calculated equal in all classes of power—steam, Diesel or electric, on a per 100 mile "day" basis).

Up to now, steam locomotive people have discussed Diesel economies with baited, censored breath. The Great Northern's frank attitude is refreshing. Let us cite the performance of the famous Class N.3 G.N. steam mallet engine. On the Mesabi they're coal fired. They averaged out, in July 9,684 gross tons per locomotive mile, which explains in cold facts they run down to Superior-Allouez docks with 16,500 tons a load, and back with a 4,500 ton load of empties. These old chuggers, who do their best work at about 13 to 18 knots per hour, turned up with a cost of 111.47¢ per locomotive mile. But here's the catch: The tabulation is for July —hence no item of winter repairs. And, secondly, remember those 16,500 ton loads run mostly down grade.

Okay, now let us turn 1,000 miles west to the Kalispell Division, where this Class N.3 Mallet is an oil burner, working in team with the small fleet of Diesels. Here we find everybody in the mechanical department busy putting on new welded steel boilers, roller bearing journals and all kinds of new gadgets, spurred on by the refinements they observe working so well on the new Diesels.

Steam power has been rudely awakened by the advent of Diesel. And here is a beautiful case of a mechanical department working like fury to improve old steam dobbin.

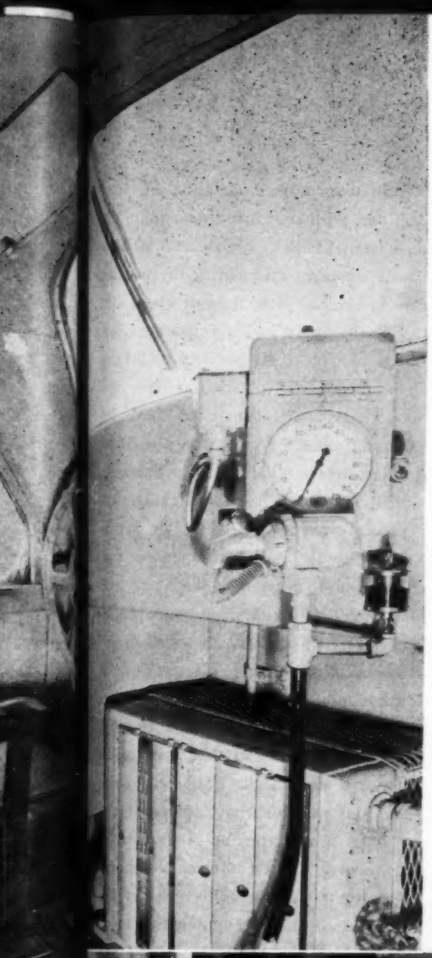
The N-3's on the Kalispell Division—oil burners—average out as a group, 79.56¢ per mile, while the gross tons per locomotive mile here is 3,921 tons. Handling from 3,700 to 4,187 tons of an almost identical class of freight train over the same identifical route, the 9 big 5400 Diesels turn up with a cost from 77.95¢ per mile down to 62.31¢ per mile, with fuel costs ranging from 34 to 40¢ per mile—the top figure almost exactly equal to the N-3's burning low grade boiler oil. Speed, braking downhill,



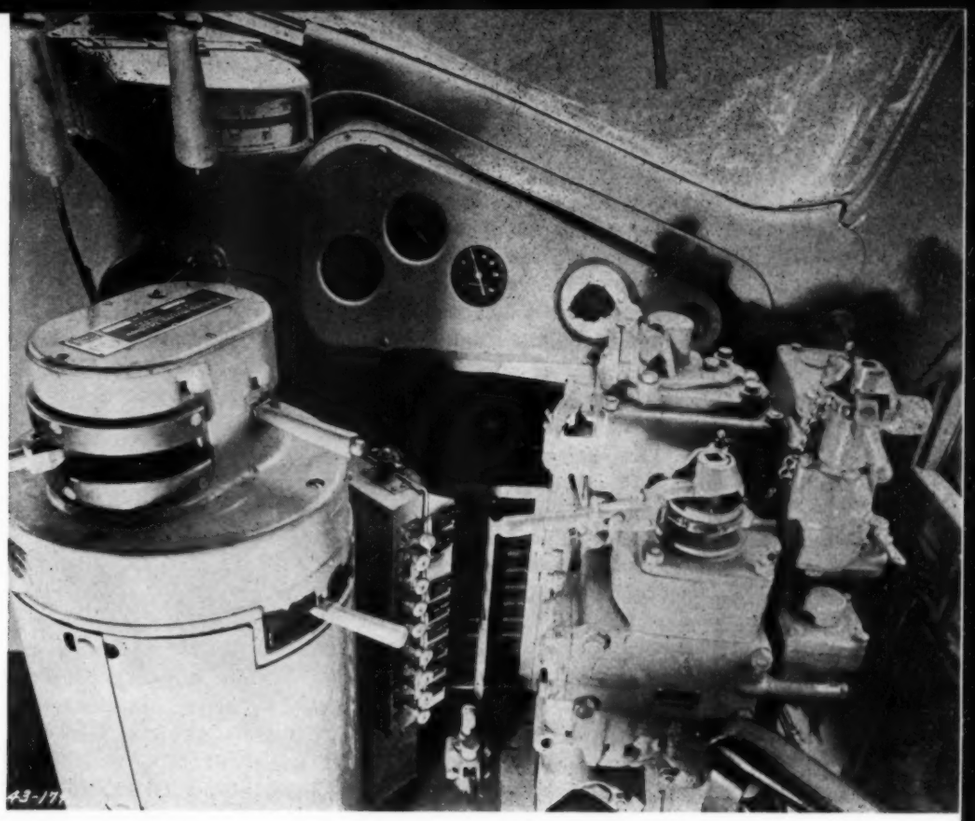
Firemen's position in Great Northern, Gener Motors Diesel freight locomotive.

availability, etc., has not been equated, but the fleet of N-3's handled 220,000,000 gross ton miles in our July-month, as against 315,500,000 gross ton miles for the nine 5400's and the Walton-Summit Diesel helper. As a group, the Diesels cost about 15¢ per mile less to run than the big, slow N.3 steam locomotives.

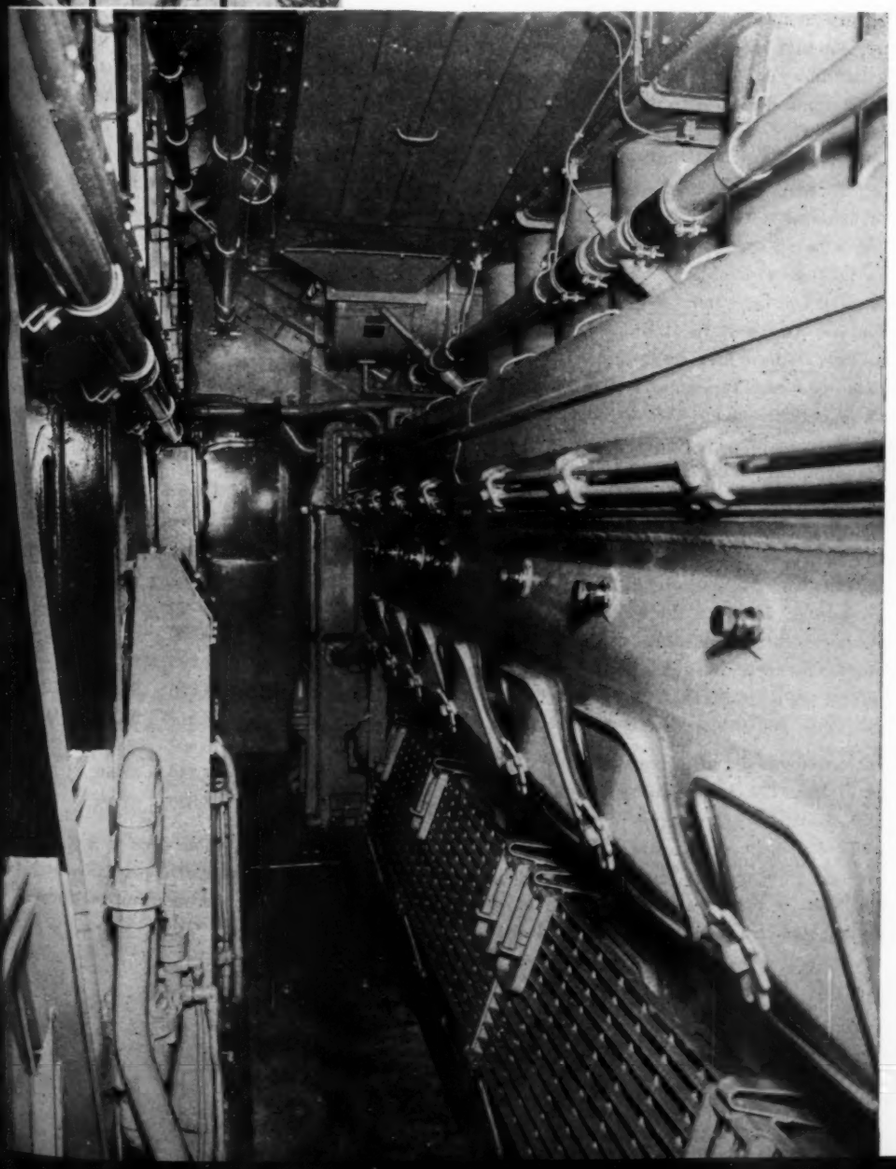
One more interesting statistic: Taken as a class throughout the entire system, the oil fired type of N-3 Mallet steam locomotive turns up with a cost of 79.60¢ per mile, which proves that in big power, steam comes closest to Diesel, if costs per mile alone govern the picture. Speed, high availability, stops for fuel and water, long hours parked in the shop, etc. present a picture that justifies Diesel and the higher initial investment for Diesel, not to mention the flexibility and ease of multiple-usage of Diesel on every kind of run. Remember the N.3 G.N. steam engines will safely operate at scheduled



Below: Runway alongside one of the Electro-Motive, 16-cylinder Diesels in the General Motors freight locomotive.



Above: Engineer's position in the Great Northern, General Motors Diesel freight locomotive.



speeds on only about 30% of the total track mileage of the entire system. You don't have any limit or defined operating region with Diesels as far as bridges, rails and tunnels go. You can run trains with sawdust burners at 25¢ per mile, 20 miles speed, but nobody would ride or ship on them. So costs do not always give the right answer unless they are costs of what kind of service.

As mentioned above, the G.N. Diesel operations divide into 5 main classes, plus its fleet of Diesel switchers that fit into a routine, well-established traditional picture that doesn't need much comment. They work. They're cheap, flexible, fast and easy on track, and it won't be long before the old steam switcher will die out in the USA.

The novel, Road usage of switch engines as road engines is a typical Great Northern invention. Fastest of them is the Sioux City, Iowa—Willmar, Minn. daily round trip of 450 miles. A four-car train and a 1,000 hp. General Motors switcher with heating boiler burns up the landscape overnight. Another group of 3 perform a double function on the long St. Paul-Grand Forks-Duluth triangle, leaving St. Paul at 8:30 A.M. on the Alexandrian, No. 11, arriving at Grand Forks at 6:15 P.M. (320 miles via St. Cloud) then out on No. 36 the night train between Grand Forks and Duluth at 10:30 P.M. arriving in Duluth at 8:30 A.M. after a fast

300-mile overnight run. This switcher has an 18:59 gear ratio and will run 75 miles per hour with 5 cars, its normal consist. After switching in Duluth all day, it leaves at 9:30 P.M., Grand Forks at 7:15 A.M., off for St. Paul at 12:01 noon and back in St. Paul at 8:30 P.M. where it can pitch in and do switching all night if necessary. A 1240 mile cycle for each engine every 48 hours. It takes 3 of these locomotives to make the cycle. Each piles up about 11,000 miles per month in this tough service. The 312-mile daily round trip between Sauk Center and Bemiji is another hotshot road switcher operation. The Fargo-Devils Lake 316 mile round trip operation likewise. Newest is the Stanley to Grenora, 88 miles each way to connect with valuable mail and express for northwestern Dakota farmers. Seven of these jobs are General Motors, four are Alco.

The Gopher twin 2700 hp. 2-unit Diesel freighters, in our typical month, rolled up 10,403 and 10,008 miles respectively in passenger operation on the fast 85 mph. run between the two twin cities, plus 4,824 miles and 4,794 miles respectively in added freight operation, giving No. 250 a gross July mileage of 15,227 and No. 251, 14,802 miles in a single month. No. 250 showed an even 100% availability and a cost per mile of 35.53¢. No. 251 showed 96.6% availability and a cost of 37.12¢ per mile. The two turned out just over 18,000,000 gross ton miles as freight haulers, not to mention pulling passenger trains daily, each way, that brought in close to $3.50 gross per mile of operation!

Between October 24, 1941 and July 30, 1944, this unique Walton-Summit Diesel helper has ground out 136,969 miles of high availability—averaging 100% month after month—service running uphill 17 miles with a 127,000 lb. drawbar push and pull helper load of 80 cars, back in 100 car, 5,000 ton transcontinental freights. Number 300 is the only one like it operating anywhere in the world, with its 3-unit drive-wheels requiring heavy sanding all the way up; running absolutely empty all the way down; never having to be turned around and its 1,350 hp. Diesels hardly stopping for a month at a time. Repair costs to date have averaged 32 cents per mile, heaviest of any Diesel ever built, due to its enormous monthly mileage piled up at full load. July, 1944 was a bad month to take off tricky figures, however, because a $10,000 overhaul job was charged making it cost $277 per mile to run that one single month! Fuel costs run nearly 40¢ per mile.

The Butte freight Diesel experimental baby on the light rail, low tunnel, light bridge route, needing a $1,000,000 face lifting if big steam power was installed instead of Diesel, this Diesel, a 2700 hp. two unit strictly freight General Motors Diesel, has piled up since October 18, 1941, a total of 238,685 miles. It hauls up to 1400 tons on the tortuous Continental Divide route between Great Falls and Butte, and so far its repair cost has been about 12.27¢ per mile, not bad considering the terrific run it makes. In the July statistics it turned out nearly 11,000 miles of service. So successful has this locomotive been, that the five 4040 hp. 3-unit Diesels now on order were obviously inspired for use on other similar rugged Montana railroad trackage operated by the G.N. On the Kalispell Division heavy freight Diesel operation, as referred to many times in this article, the Great Northern is concentrating its main-line big Diesel freight power. When the Empire Builders, ordered in December, emerge as 5 magnificent 11-car streamlined trains, equipped with 2-unit, 4,000 hp. General Motors Diesels, and the five 4050 hp. 3-unit freighters, plus the 6 more 5,400 hp .freighters, four of which were delivered after our July statistical record and 2 more in 1945, Montana will be the site of practically a 100% Diesel operation between Whitefish, headquarters of the Kalispell Division and Havre, a mainline distance of 256 miles; down to Great Falls, and through to Billings and Butte. With the Havre-Great Falls line, the G.N.'s routes make a large X through central Montana. By judicious operation of the 21 freights and 5 passenger Diesels, and probable use of the new 4050's as either main-line passenger locomotives or as road engines on the two Montana branch lines, peacetime can well find the whole G.N. operation between Spokane - Havre - Butte - Billings 100% Diesel. Railroaders have long realized that it isn't possible to operate Diesel and steam up to 100% efficiency where both have to be used in the same territory, thus requiring dual sets of facilities, manpower skills and equipment. Another angle frequently presents itself when traffic justifies and supply of motive power is short, and that is of extension of runs clear over to Spokane and Wenatchee. Either alternative—fill in with steam all the way from Havre to Wenatchee or concentration entirely in central Montana, offers sensible postwar operating routine for the G.N. Diesel fleet.

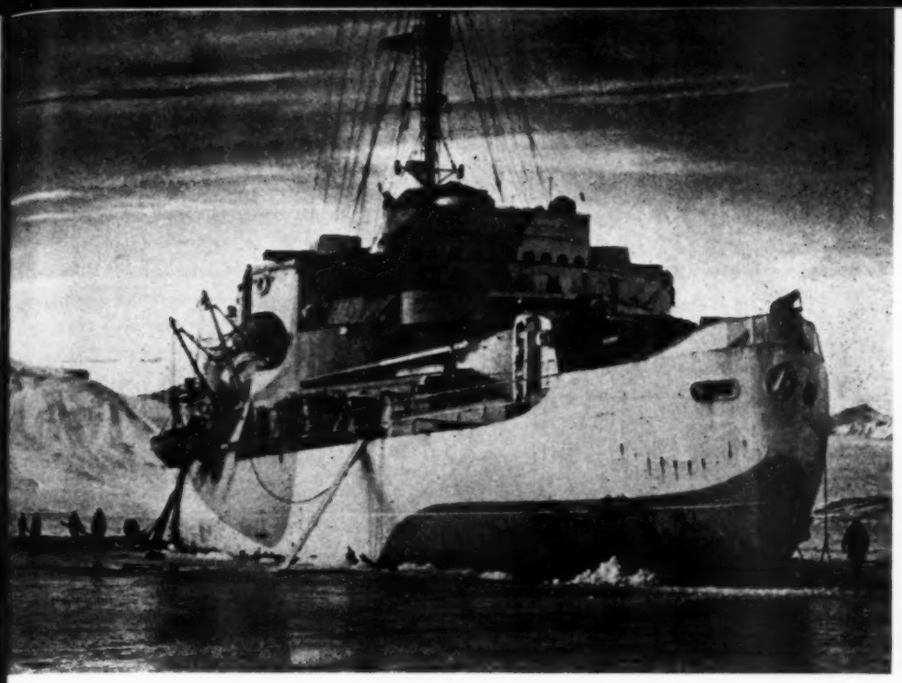
A word about the new Empire Builders: Here again the G.N. has pioneered with a bright idea. Instead of planning its postwar passenger traffic with high speed, extra fare streamliners, overriding its regular "must" daily passenger schedules, it plans to convert at one blow a present standard popular, nationally advertised passenger train from a 58 hour to a 44 hour daily streamliner, with schedule that equals the best of the present 39 hour West Coast streamliners, permits sleeping and eating in greater comfort, and release a whole fleet of good, but heavy, older Pre-War trains for important secondary passenger and mail service. Nothing but Diesel motive power will permit this new train to move. Each will consist of 11 lightweight, Pullman-built alloy steel cars pulled by a 4,000 hp. General Motors Diesel locomotive. Each train will weigh 624 tons, as against 809 tons for a conventional train of the same capacity. The consist will be a mail-baggage car; 4 daycoaches—3 of 48 passenger capacity and one of 60 passenger capacity; a coffee shop-dormitory car, full dining car, 3 room sleepers and an observation lounge-buffet car. Each train will accommodate 198 coach passengers and 156 sleeping car passengers. One feature, as yet unpublicized, is the fact that this train's schedule Eastward out of St. Paul will coincide with the present Morning Zephyr of the Burlington. The Burlington, as is known by some, is ½ owned by the Great Northern. *As was to be anticipated, announcement of the $7,000,000 Empire Builder Dieselization and Streamlining program by the G.N., threw the entire Northwest Railroad picture into a state of jitters. Since the formal consist of the 5 trains was announced, there have been several tentative revisions, and possibly ADDITIONS of MORE CARS to the trains. As word of what the G.N.'s frantic competitors plan to do in retaliation leaks out, the G.N., not to be caught napping, keeps moving its plans ahead a notch. The Milwaukee is already rumored to be considering a fleet of 6 Fairbanks Morse Diesel-powered Northwest Hiawathas on their route.*

Cumulative Statistics

Following is a brief statistical highlight of the 9 G.N. 5400 hp. 4-unit, General Motors Diesel freights, taken as of July 31, 1944:

Date In Service	Loco. No.	Cumulative Miles	Availability	Repair Cost Per Mile
Dec., 1943	400	75,112	94.9%	
January, 1944	402	58,463	94.5%	22.7 ¢
January, 1944	404	57,828	94.0%	13.2 ¢
March, 1944	406	42,856	93.5%	11.6 ¢
March, 1944	408	41,038	91.5%	19.55¢
May, 1944	410	18,519	92.0%	18.2 ¢
June, 1944	412	16,801	90.0%	28.9 ¢
June, 1944	414	15,356	83.5%	14.35¢
June, 1944	416	13,820	87.1%	23.35¢

Repair costs for the whole fleet of 9 for July, 1944, averaged out at 17.02¢ per mile; and it cost 67.86¢ per mile to run them, exclusive of the cost of crew.



Diesel-electric Coast Guard Ice Cutter "Eastwind" seen off Greenland during liquidation of German radio-weather station. Official Coast Guard Photo.

COAST GUARD'S NEW DIESEL-ELECTRIC ICEBREAKERS

Aid in Smashing Nazi Arctic Weather Bases

WHEN Coast Guardsmen smashed a recent German attempt to establish fortified weather bases in Greenland, two of the most unusual ships constructed since the start of the current war contributed to the success of the engagement. They are the new Coast Guard icebreakers — *Eastwind* and *Southwind* — which came down the ways only a few months ago, bristling with "firsts" in the marine field.

The sea-going "ice picks," designed to roll, pitch and grind their way through solid masses of ice in Arctic areas, made their maiden voyages to join in on the battle with the Nazis in ice-packed waters only a few hundred miles from the North Pole. Summoned on an emergency mission after the Coast Guard Cutter *Northland* sustained a smashed rudder while pursuing the Nazis through the ice pack, the *Eastwind* and *Southwind* responded with a 3,000-mile full-speed run to the scene. Previously the *Northland*, after a 70-mile chase through ice floes, cornered a German trawler, forced its scuttling, and captured eight Nazi officers and 20 enlisted men.

The two-month battle with Germans attempting to establish weather stations in Greenland came to a climax October 16 when the *Eastwind* and *Southwind* closed in on another armed trawler. On the previous day, a patrol plane from the *Eastwind* sighted the ship and a Nazi camp on the east shore of Greeland. After a Coast Guard landing party captured Germans in the camp, the two ships plowed through icefields and "storis"—ice 20 or 30 feet thick—to the location where the Nazi trawler had been spotted. An hour later the icebreakers sighted their quarry.

Bracketing the trawler with salvos from the main batteries, the icebreakers' officers soon saw that the Nazis had left their ship and fled to safety on nearby ice ridges. Coast Guardsmen rounded up the Germans and a prize crew was put aboard the vessel. Ability of the two new ships to maneuver through the ice was largely responsible for the success of the operation.

Unique among sea-going ships of today, the icebreakers *Eastwind* and *Southwind* were built in the San Pedro, Calif., yards of Western Pipe and Steel Company. Almost all machinery and gear aboard is operated by electricity, provided by six 2000 hp. Fairbanks-Morse opposed piston Diesels and Westinghouse generators. Through the medium of electricity and its control, many of the innovations aboard the breakers have been designed for specialized tasks peculiar to crushing thick ice in northern waters.

Among "firsts" in the new type breaker is the use of forced "heeling"—a hydraulic system employed to rock the ship and assist in keeping the vessel from being frozen into thick ice. With the help of large tanks located between a double hull on each side, into which water is pumped, a sort of slow motion maritime teeter-totter effect rocks the vessel loose. Marine engineers term this effect "heeling and trimming."

The idea was adopted by the Coast Guard, and a method to carry it out was developed by Westinghouse Electric and Manufacturing Company and Fairbanks, Morse and Company, in cooperation with Coast Guard marine engineers, Westinghouse built the electric motors and controls for the heeling and trimming system and Fairbanks-Morse designed and built the pumps.

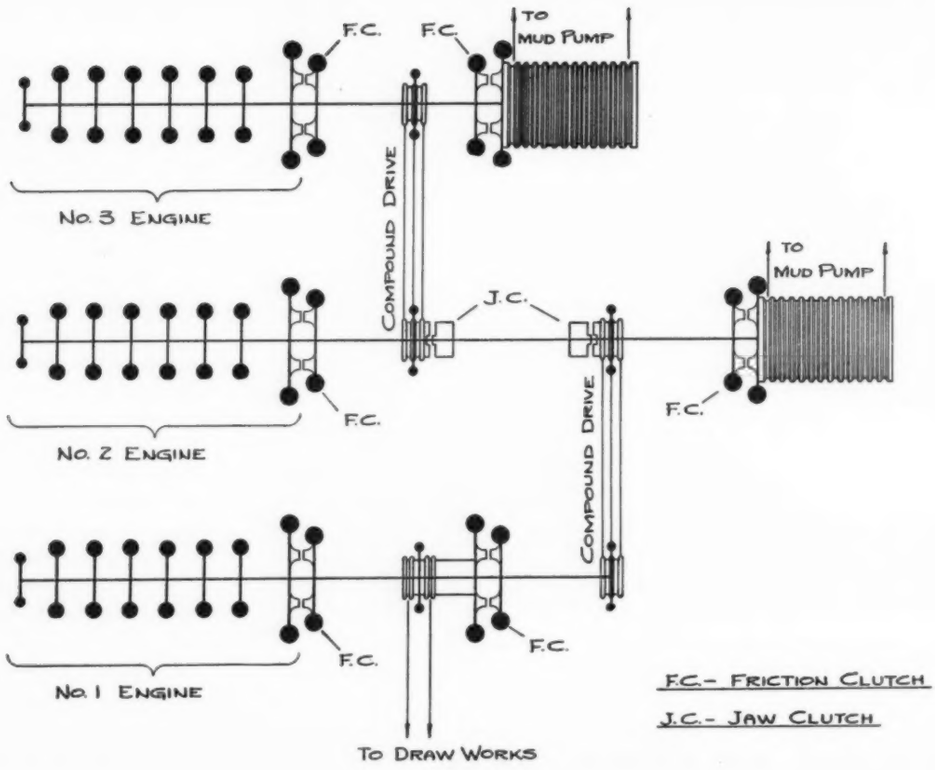
Another feature on the new craft is a bow propeller. Originally developed in 1888 for ice breaking on the Great Lakes, the bow propeller has been adopted by practically all Baltic countries as an important weapon to conquer ice. Unlike conventional propulsion propellers—located in the stern of a ship and which pushes water behind a vessel, the bow propeller can churn the water ahead or astern of the breakers. Resulting turbulance causes ice to buckle and break away from the bow.

The *Eastwind* and *Southwind* also boast a unique crow's nest, which usually is simply a lookout post. On the icebreakers, the crow's nest also serves as a remote control station for most of the operating equipment aboard. Engineers point out that this feature enables the ship to weave through ice floes when visibility from the bridge is impaired.

Largely because of rigorous demands made on the ship during ice breaking operations, a completely automatic electric rudder control has been installed. Known as a Westinghouse Rotorol—a device familiar to machinery men because of applications in speed control requiring close regulation of milling cutters, tubing machines, lathes and other apparatus, this rudder control electrically balances two rheostats in the pilot and steering compartment.

Tribute to the effectiveness of the revolutionary type icebreakers was paid by one of the Nazi officer prisoners taken by the *Eastwind*. He declared:

"We thought it was a tank of some kind. No ordinary ship could come through that ice."



SHAFT SYSTEM — DIESEL MECHANICAL RIG

DIESEL ENGINES FOR OIL FIELD DRILLING

By HAROLD F. SHEPHERD*

Editor's Note: We are pleased to bring Mr. Shepherd's comprehensive treatment of the above subject to the readers of DIESEL PROGRESS; the article goes much deeper than the usual approach. This is No. III in a series by men in the Diesel Industry who thoroughly know their fields.

Foreword:

A report is requested on the present status of Diesel engines in the oil well drilling industry. This might be covered in a statistical article. Oil field statistics are published regularly in the engineering news journals of the industry, however, and it is believed that interested readers are continuously in touch with drilling progress.

An article with an economic slant might be attempted as "Steam vs. Gas Power vs. Diesel," but, the conditions under which present rigs operate are so variable that any attempt to compare drilling costs in general on the basis of power cost would be folly. The broad principles are evident.

It is assumed that the most pertinent subject in the present situation is the engineering status of the Diesel engine models which have been used for drilling and, it is hoped, will soon again be in quantity production for oil field sale.

Drilling Engines:

Relatively few Diesel drilling engines have been supplied for domestic use during the war years. Most of the authorized production has been allocated to foreign operations for the development of oil fields in countries closer to the military fronts. By very reason of their small number, however, the engines delivered and in service have been under the very closest scrutiny by the oil field engineering staff, in field and at home. Certain rigs have been under constant laboratory observation by arranged collaboration with drilling organizations who anticipate benefits in improved life and performance when eventually they are allowed to expand their facilities.

The present state of age and repair of Diesel drilling equipment is somewhat on a par with America's automotive fleet. Allotment of engines is awaited almost as eagerly as authorization to purchase cars, trucks and tractors. As in the case of automotive equipment, in which the first production will be, it is said, from prewar patterns and tools, the small high speed Diesel engine may be, for a time, a prewar engine. This should not be the case with the larger Diesels now so much needed for economical prospecting and deep drilling.

When it is considered that there are, at the present peak, less than two thousand rotary drilling rigs in operation, that they range in power from 200 to 1950 hp. and that only a percentage is Diesel engined, it is obvious that

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* *The author is chief of the National Supply Co. Research Laboratory of the Superior Engine Division at Springfield, Ohio.*

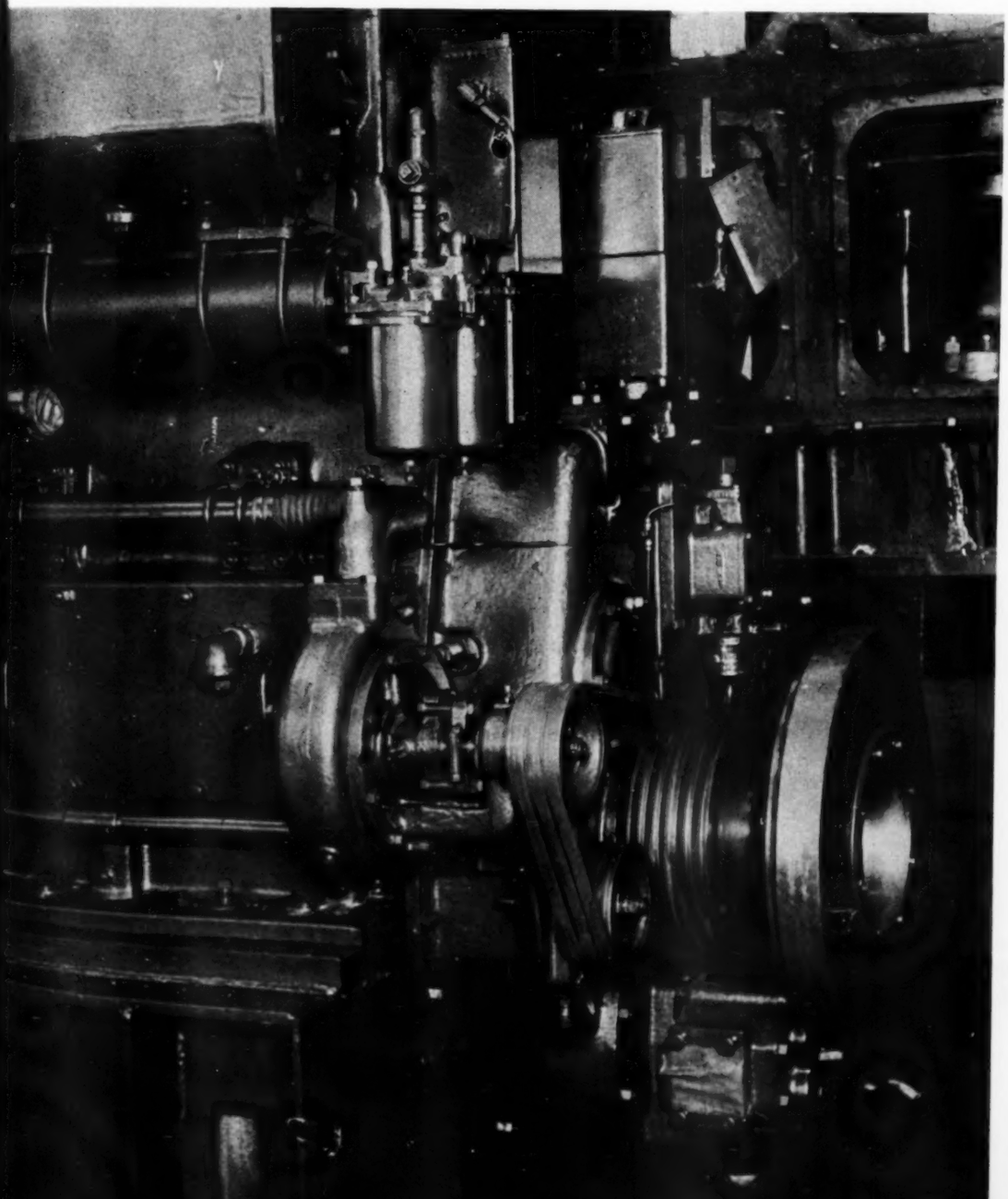
there has been, fundamentally, no such thing as a Diesel drilling engine. These engines must serve other uses as well to justify their engineering and plant cost. Since the better models of engines formerly sold for drilling are now being built for military and associated uses, in before undreamed-of quantities, facilities for their production now approach automotive standards. The searching type tests required by the U. S. Navy have required the best of laboratory and instrument facilities. These latter we now possess and have studiously applied. The oil industry will soon have the use of this experience. A brief review of the trend of improvement resulting from the developments of the war years is given in the following:

The Power Take-Off—Mechanical:

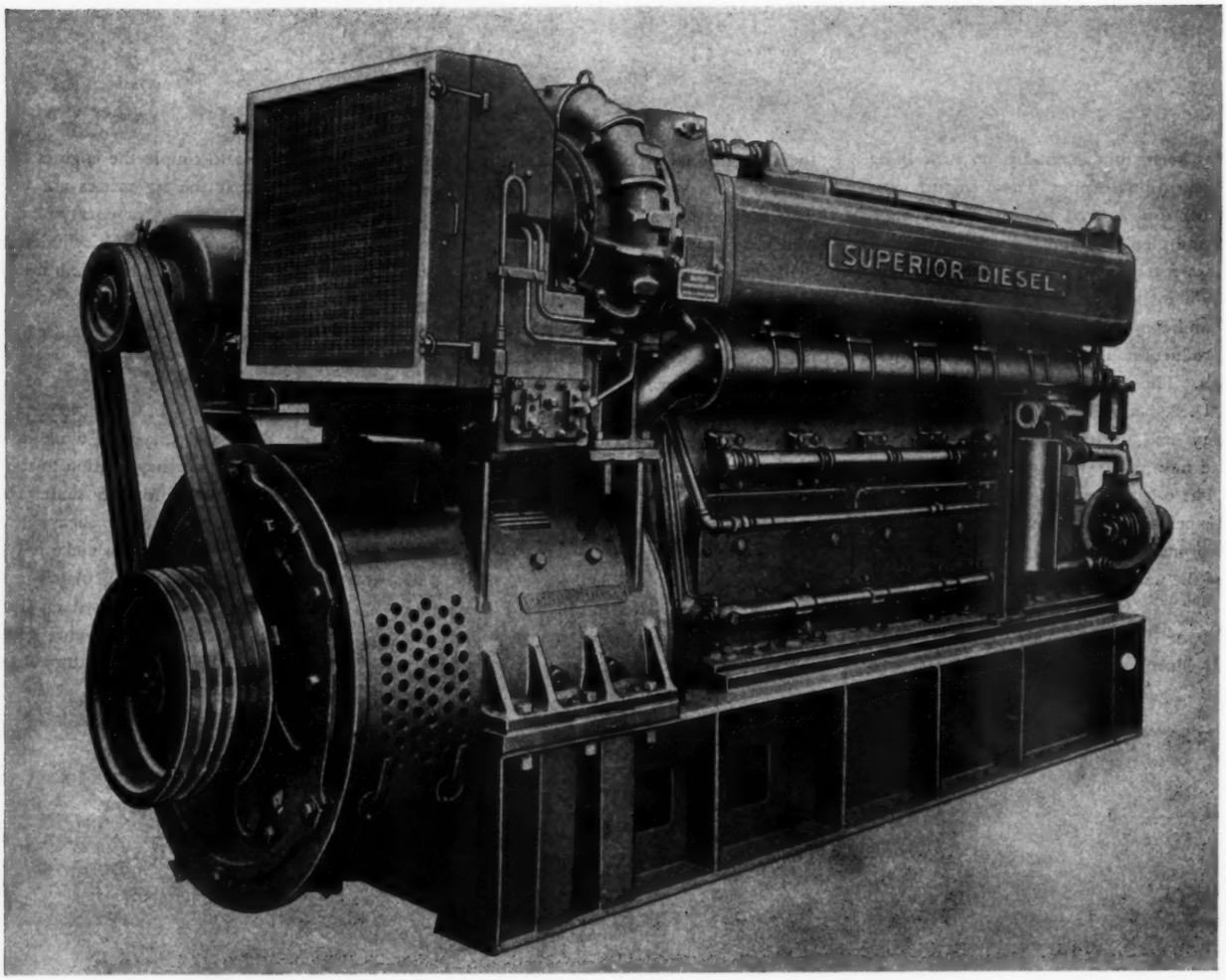
Figure 1 illustrates the mass elastic systems of the conventional type of mechanical rig transmission now in extensive use for deep drilling. Any engine may be declutched for idling in which case only its own rotating masses control the frequency of torsional vibration. Any engine may be clutched in, idling, with the rig clutches disengaged, which results in a second and lower natural frequency. One or both mud pump sheave clutches may be closed resulting in potential two-node as well as one-node systems with two additional frequencies for each unit.

All three engines may be compounded for hoisting, driving the draw works through chains. Chains, fortunately, do not seem to set up additional mass elastic systems between engine and engine nor do V-belts transmit the harmonics of the engines or pumps to any appreciable extent. From the foregoing it is apparently very desirable to couple the engines to the rig so flexibly that the rig masses are unable to influence the frequency or energy of the vibratory torque natural to multicylinder engines, thus reducing the vibration possibilities to one problem.

Early light rig transmissions probably isolated the engines successfully by reason of the lack of torsional rigidity of their shafting just as the rear drive and wheels of a motor car are isolated in low frequency relation to the engine by the long slender propeller shaft. However, rig shafting is subjected to heavy transverse loads and the tendency is to make it very stiff; consequently other and calculated means of isolating the engine rotating systems from those of the rig transmission are being considered. Two National rigs under laboratory observation



Close-up view of drive end of Superior Diesel fitted with bonded rubber damper.



Supercharged Superior Diesel with variable voltage generator. (Two bearing generator is preferred for drilling)

are at present drilling with torsionally flexible power take-off couplings of very low frequency.

It will be understood that the natural frequency of the engine system should be as high as possible so that the engine operates below potential critical speeds. The take-off uniting the combined system should be very soft, its potential critical speeds being below the operating range.

Adequate instrument work has been done to demonstrate the correctness of these principles.

Life tests are now progressing into the second year with commercial and modified commercial couplings with good results. Various other couplings are under endurance tests in the laboratory where the relation between engine and dynamometer systems may be adjusted to test for working stress or frequency.

The drilling engine, like the automobile engine, usually has an overhung flywheel. It is not feasible to use outboard bearings with a skidded unit. The detection of wheel shimmy, which may be critical and destructive, poses a problem for which no suitable commercial instruments have been made.

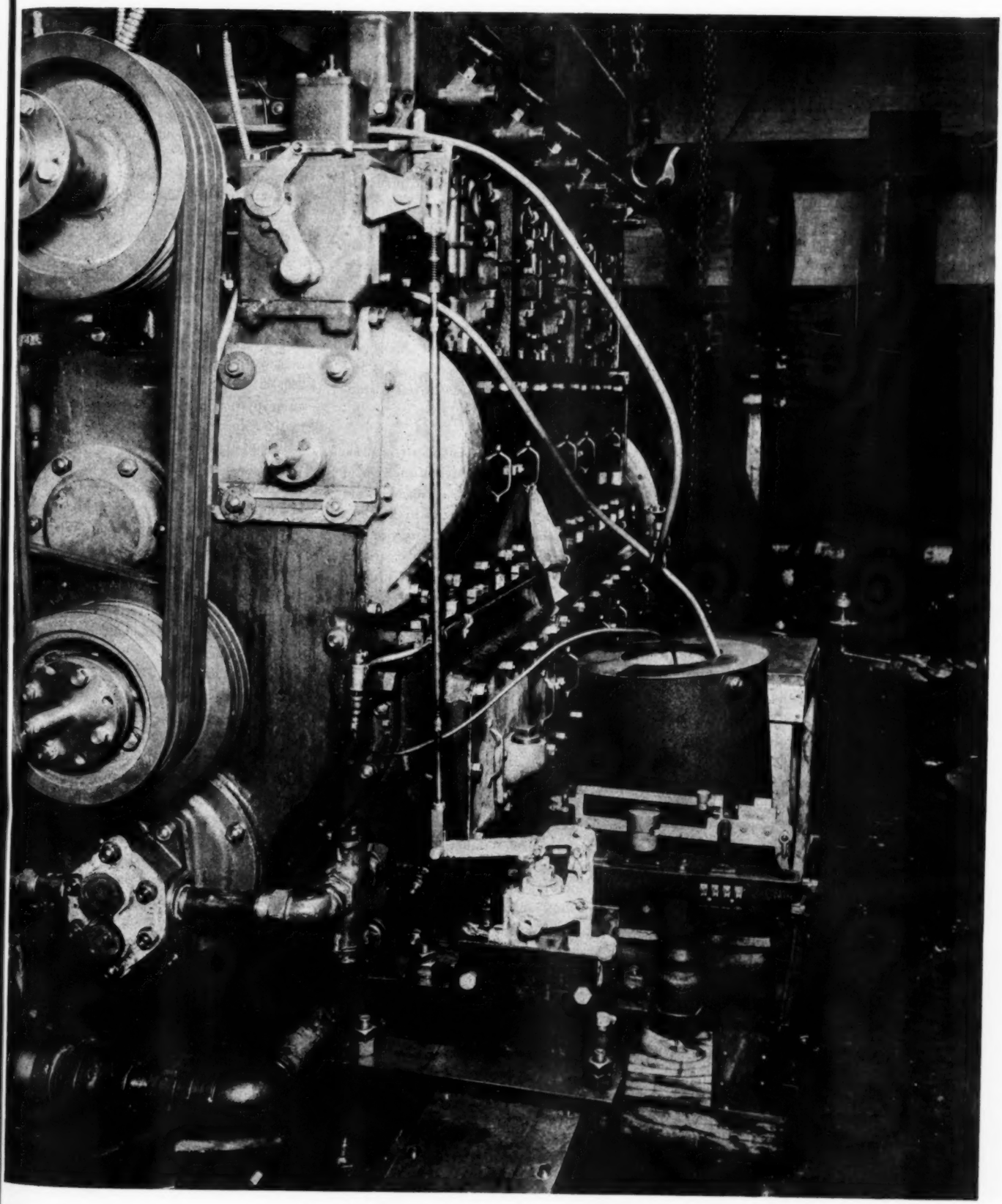
Electrical recording apparatus for this purpose was developed in the laboratory for investigation and correction of generator ventilating fans. This has been applied to drilling engine flywheels of extreme dimensions, light and heavy. Some of the resulting designs have been under field test in deep drilling for a year. Application of the principles developed will certainly prolong the service life of bearings and of the crankshaft itself.

Power Take-Off—Hydraulic:

All types of hydraulic couplings and torque converters have been applied to rig drives. Reasons for their use vary. The driller may desire such drives for use in keeping a strain on pipe or line when fishing, or for preventing the addition of the engine mass inertia to the torque when tools or pipe freeze in the hole. He may find the slip characteristic useful for driving mud pumps at the final stages of cementing.

The engine builder may reasonably expect adequate isolation of the engine torsional system from the rotating masses of the rig when hydraulic drives are applied. Careful tests show that there is no measurable transmission of engine harmonics through the hydraulic system if the fundamental rolling amplitude or firing impulse be excepted such as the fourth order in eight cylinder four cycle engines. Even these latter are made harmless. Thus the frequency of the engine system with filled coupling does not change as rig elements are engaged or disengaged.

As an offset to this, couplings in the past have been vastly too heavy. It is believed that this situation has been corrected and would have been corrected long ago had steel and tools been available for making pressed and welded assemblies such as certain automotive fluid drives. The disadvantages of the heavy fluid coupling is that when driven by the engine through a torsionally rigid connection, the natural frequency of the system is lowered as much, perhaps, as it would be by direct drive to the rig transmission itself. The present expedient is to drive the fluid coupling through a tor-



View showing set-up for test of Pneumatic Control on a Superior Diesel. For field use the actuator is protected against mud and water by a cover.

sionally flexible mechanical coupling.

In considering the amount of weight reduction desired it should be remembered that frequency as related to mass is a square root function; also that the relation between the crank system masses and the drive masses of flywheel, clutch, and hydraulic coupling positions the node. Roughly halving the rotating mass at one side of a node raises the frequency only as the square root of 2 or 1.41 times (41×). Consequently the trend is not only for lighter hydraulic units but for the very lightest practicable hydraulic units.

The Power Take-Off—Electrical:

Separate Diesel-electric drilling barges have been used for the past twelve years for drilling in the deeper tide water and lake locations. Some generator and motor control systems employed are similar to those which have been used in Diesel-electric locomotive drive for many years. The driller's control varies the engine speed so that the engine is worked at an efficient mean effective pressure while generating the required horsepower or kilowatt energy to overcome the load resistance. Others use constant generator speed and vary generator excitation only to control voltage and motor speed.

The simplicity of the presently proposed systems, from a mechanical viewpoint, is to be appreciated. Early designs in which one or two generators and a direct coupled exciter were strung out on the same shaft line as the engine present involved problems for the mechanical designer in that two or even three nodes of torsional vibration were possible. A single generator with V-belt drive for the exciter is ideal.

Whether the generator for drilling is to be of the single bearing type, with a laminated (Thomas type) flange coupling to support and drive the generator as in railroad or submarine practice or a two-bearing unit with a torsionally flexible coupling, remains unsettled. It seems that the combination of an independent generator with two bearings and a rather universally flexible coupling is preferred for the reason that rig foundations and even barge foundations offer no certain facilities for aligned support of the engine and generator

From the transportation viewpoint the latter is certainly preferable since the units are loaded on trucks by the simple expedient of lifting one end of the skid on the truck winch line until it comes over the tail. In this necessary operation considerable strain might be thrown on a supposedly rigid assembly which, however, was designed for use and not for transportation.

Dampers:

Most engines of the automotive type having six or more cylinders, are now fitted with torsional vibration dampers. Although numerous attempts were made, before the war, to fit such dampers to larger engines, the types employed proved to be short-lived, ungainly and often erratic in performance. The bonded rubber damper has survived tests for fitness and applicability in which purely mechanical dampers failed. Its first cost, and consequently its replacement cost are low. By small changes of mass or stiffness it is readily adapted to the variety of conditions imposed by driven machinery of various types.

Fig. 4 shows a bonded rubber damper in place on a Diesel-electric generator set, of the general type used for drilling. Two such dampers are now undergoing endurance tests in a Diesel industrial locomotive, in which service the cycles are intermittent and repetitive, and in that way similar to the operations of drilling. The basic engine has been in use for drilling for some years in the U. S. and in foreign fields. The engine alone requires no damper but should the attached masses, extending the torsional system, so lower the natural frequency as to introduce criticals, as has happened, suitable dampers are available.

In the past it has been the custom to mark dangerous critical ranges on the tachometers in red so that they may be avoided. Unfortunately the tachometer and its drive are the first to suffer from torsional vibration. The instrument, should it become inacurate, leads into danger rather than away from it. The present aim is to eliminate "red zones" entirely from the range of speeds used for the various operating requirements of the rig.

Extended use of the electro magnetic torsiograph together with the harmonic analyzer has immensely facilitated the development of dampers in this laboratory. Analyses which once consumed weeks of time by mathematical means are accomplished in a day with this apparatus. The proofing of dampers becomes a routine matter rather than a major venture into physical science.

Supercharging:

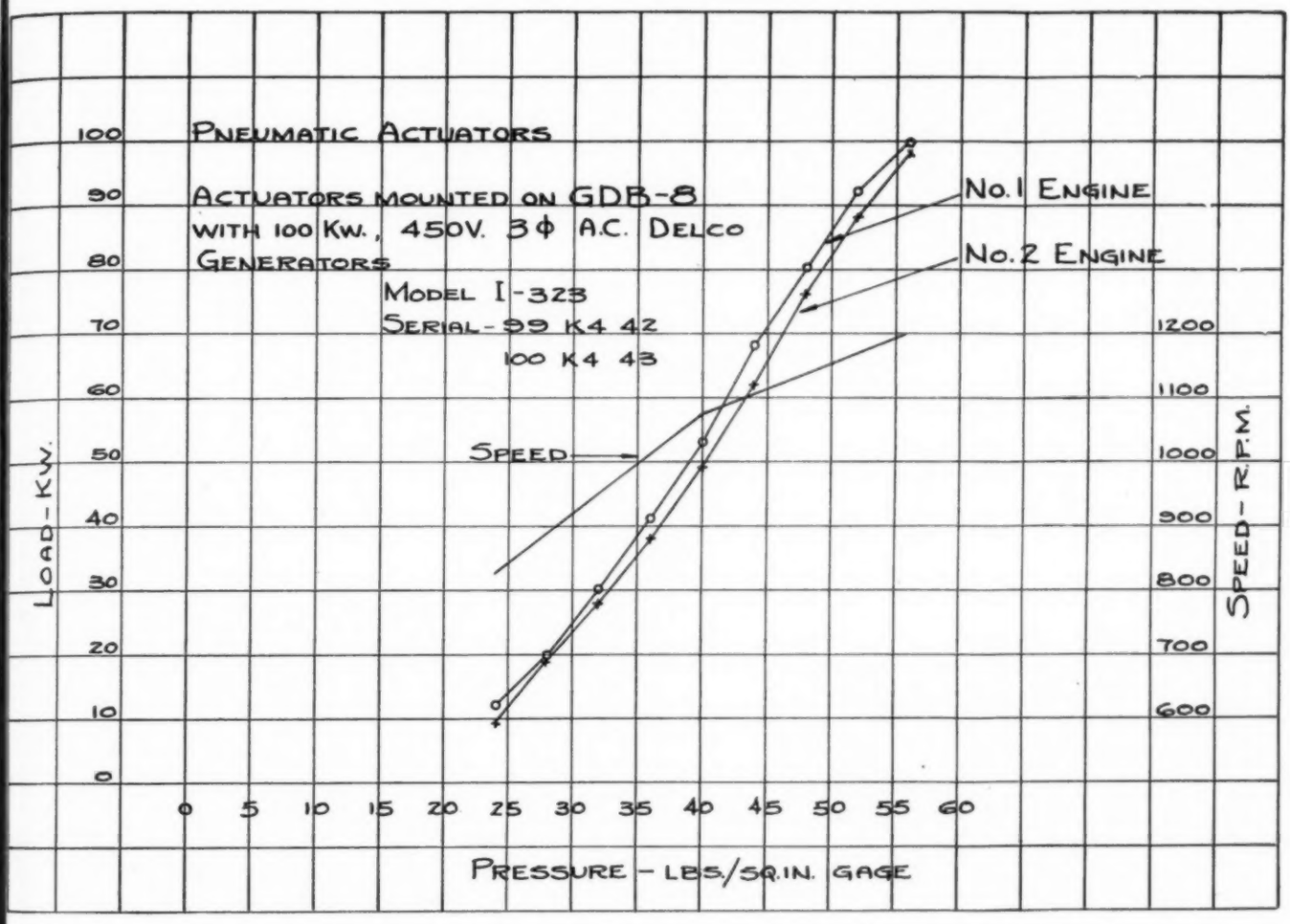
Two 125 hp. or 150 hp. engines, not always compounded, suffice for development drilling up to 3000 or 4000 ft. For general drilling requirements, however, at over 4000 ft., bigger engines with selective compounding are the order. For deep drilling, the time consumed in the hoisting operations of lowering the bit, in stages of three joints of drill pipe to the working face of the hole and retrieving it for replacement in like manner becomes a very important factor. Since a 9000 ft. hole will use 100 stands of pipe and an 18,000 ft. hole 200 stands of pipe, rapid hoisting is of utmost importance. The trite saying is, 'Hole is made when the bit is on the bottom," and one bit makes relatively little hole in hard digging.

The drilling string and associated equipment used recently for a 15,000 foot hole weighed 250,000 lbs. Neglecting buoyancy as probably offset by friction, to lift this weight at the rate of 100 ft. per minute requires very close to 750 hp. This suggests that 1000 hp. at the draw works motor is none too much. Other services used while going in or coming out of the hole are mud pumps for mixing mud and filling hole, rotary drive for unscrewing pipe, lights, compressed air, water service, etc. The rig which requires 1000 hp., to be available at the draw works may well have as much as 1600 total engine hp., the latter certainly, if electrical losses in generator lines and motor are to be compensated. This is the deep drilling power picture for the moment but estimates are going up and two thousand or more hp. may be applied before long.

Since any unit of a rig should not weigh more than fifteen to twenty tons for haulage on commercial trucks and compliance with highway load limitations it is evident that drilling engines of high power, particularly when the generator weight is added to the unit, should gain their rating without any great increase in cylinder dimensions or overall dimensions over those at present producing 250 to 300 hp. on the heavier rigs. This suggests exhaust turbo supercharging.

This type of supercharging has won its place in pipe line work after six years, the first of which were not too happy, partly because the inventor's advice was not scrupulously followed.

The same is true of locomotive work where Buchi type superchargers have been in use in the U. S. A. for about seven years. During the first year certain antifriction bearings proved unsuited to the service and were replaced by ingeniously lubricated plain bearings which have been satisfactory. The author's company has furnished some seventy odd sets of high



Test results on compounded Diesels, fitted with Pneumatic Controls, and driving alternators in parallel.

powered supercharged engines during the war years without a single distress case. Also several smaller units of a size suitable for drilling, the basic engine of which has long been used for that purpose. Such units will shortly be offered for drilling service. This will result in a fifty per cent increase of power with a very moderate addition to weight and size. Due to the thorough scavenging resulting from turbo supercharging the increase of power results in little if any rise of exhaust temperatures or maximum cylinder pressure and no apparent increase in engine maintenance cost.

Controls:

Diesel drilling engines are speed-controlled by the driller from his station by hand throttles for the continuous operations and by a foot pedal "accelerator" for hoisting. The connections between the throttles and the engine fuel or governor controls have usually been mechanical, resembling the sprocket chain and wire controls used in ships' telegraph systems. Rods and bellcranks also have been used.

Both hydraulic and pneumatic pilot house controls are now used in many ships and these are candidates for controlling drilling engines. The pneumatic systems have some very practical advantages chief of which are: (a) The air supply itself may be used to clean the connecting tubing for reassembly after it has been dismantled for moving; (b) Small leaks do not affect accuracy of control if the air supply is ample.

It is difficult to evaluate the distribution of load between Diesel engines when compounded. On the hoisting cycles the intervals are too short to make a determination by comparing exhaust temperatures. For laboratory test purposes pneumaic controls were fitted to two Diesels driving alternators operating in parallel. The results are shown above. This is considered highly satisfactory performance. Laboratory tests have warranted standardization of pneumatic controls for production.

Metallurgical:

While only national emergency materials have been available for oil field machinery production, the builders of Diesel engines have been gaining volumes of experience with all the more resistant bearing materials in conjunction with shaft journals of various materials and hardness. A great variety of cylinder liner materials and treatments, good and indifferent, have been tried and evaluated. The NE materials in some cases have done remarkably good work.

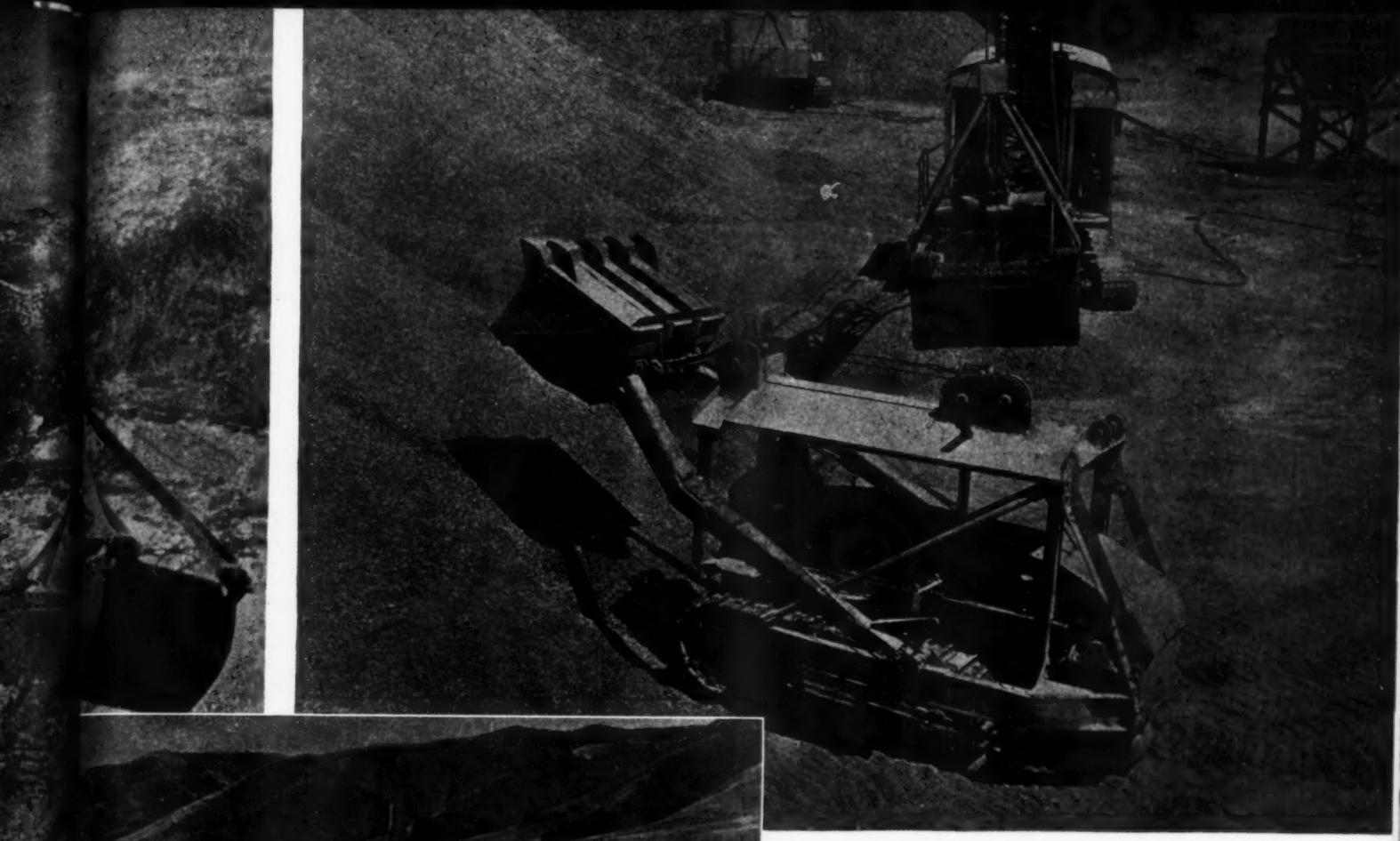
We are looking forward, however, to the day when strategic materials, as well as design and workmanship will be available for general use.

Cletrac tractor equipped with Sargent 1¼-yard bucket. Power is Hercules Diesel.

DIESEL TRACTOR TIDIES UP FOR KAISER

By F. HAL HIGGINS

KAISER is a big name in many fields today. Yet only fifteen years ago when the writer first came out to California, Kaiser was just another "gravel man"with a yen for a flier in dirt moving contacts now and then. He sometimes bit off more than he could chew and now and then got out beyond his depth and took a licking because he found things under the surface he hadn't taken into consideration. Also, he found "Old Man River" wasn't such a sissy that he could come bulling his way over from California and show up the old river contractors who had cut their teeth on levee building from the days of the mule skinners and convicts with wheelbarrows. But this fellow Kaiser learned with each venture, and he didn't make the same mistake twice.



The unit trimming up a pile of crushed stones; this outfit can throw a bucketfull over its shoulder into a truck.

Here the Cletrac, Hercules Diesel tractor is poised ready to heave its bucket-load over the edge of a cliff.

So, it is not especially exciting to find that Kaiser is still a gravel man with plants scattered around at strategic points where his jobs are. One of these is the Upton gravel pit, down the hill and around the curve from the Contra Costa tunnel east of Berkeley, California. With the new low level tunnel cutting time and climb between the Government's extensive fill and construction jobs on the Oakland side of the Bay, there has been a terrific demand for construction gravel there the past four years. Hence, this Kaiser gravel plant at Upton is in the most strategic spot for heavy production of graded gravel to meet this wartime demand. One of the handiest—almost ubiquitous—pieces of equipment that one encounters at this gravel plant is a Cletrac tractor with Hercules Diesel engine powering it and Sargent overhead bucket of 1¼ yards capacity. This little outfit is as handy as a carpet sweeper in a home at keeping things tidied up. It works all over the place on three different levels as it picks up spilled gravel under belt connections and truck loading dumps to save good material that would be wasted. Then where non-gravel strippings are pushed over the banks, it cleans up this material, carries it to the far edge of the level and spews this waste over the banks out of the way. Some of this overburden is handled twice, starting at the top level.

"We use this tractor a little, practically every day the plant runs," explained Plant Superintendent Harry Rodgers when seen on the job using the Cletrac. "It never gives us much trouble, either. Some days it is on the go all day, filling trucks with gravel when one is handy and there is some spill of good material. It is very economical on fuel, too, using very little. That straight shot at the material to be handled with a straight back-away keeps the heavy wear off the tracks and rollers, making it not only handy for the operator but also long lasting on the job without major overhaul. "Handy? Yes, it gets places nothing else could go. It was bought three or four years ago before I came on this job. Its chief chores are to clean up and load trucks. With such a big output of gravel coming out of this plant to serve the war construction in the East Bay, it is naturally a very busy machine."

The towboat Minnesota Husky, powered by 1325 hp Cooper-Bessemer Diesel.

DIESELS REVIVE INLAND WATERWAY TRANSPORTATION

IN these days of crowded transportation facilities, it is interesting to note that the nation's navigable rivers have come back into their own as vital arteries of war commerce. This trend is not surprising when we consider the advantages gained by using this oldest medium for transporting materials.

In view of over-taxed air, rail and motor transport of freight to centers of armament production, combined with critical metal shortages, the rivers have assumed a larger share of the transportation burden than ever before. This is understandable in view of the fact that it takes only about one-fifth as much steel per ton of capacity to build a river barge as it does to construct a railroad tank car.

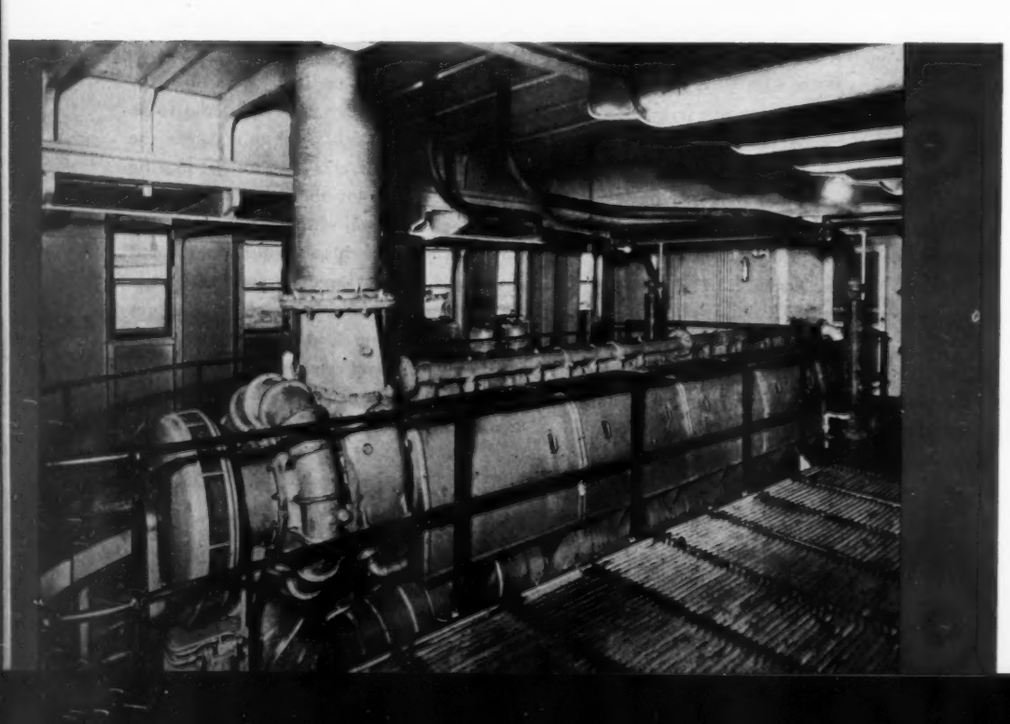
Then too, the cost of a modern Diesel river towboat is usually only about one-half the cost of a railroad locomotive built to haul an equivalent tonnage in freight.

A survey of the growing fleets of river towboats shows that most of the recent additions are of steel construction, with single, twin or triple Diesel engines using low-cost fuel oil for economical operation. The towing power of these boats ranges from 1,000 to over 2,000 horsepower and they are capable of pushing freight loads which have run over 15,000 tons.

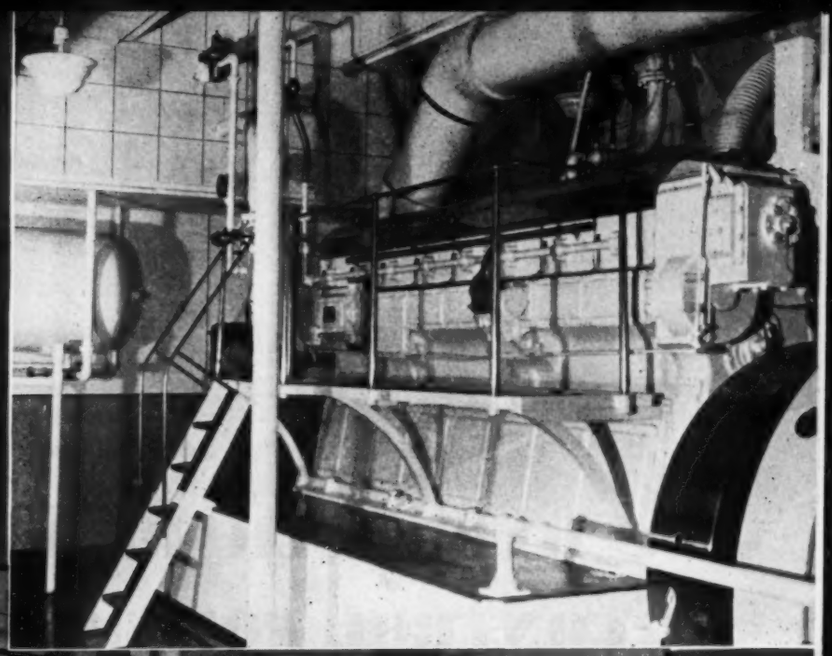
Although cargoes include such essentials as oil, coal, grain and steel, a particularly noticeable increase has been made in the transportation of petroleum products. During a recent month for instance, the daily volume from southwestern refineries alone averaged 513,000 barrels moving north and east along inland waterways, according to figures released by the Office of Defense Transportation, in Washington, D. C.

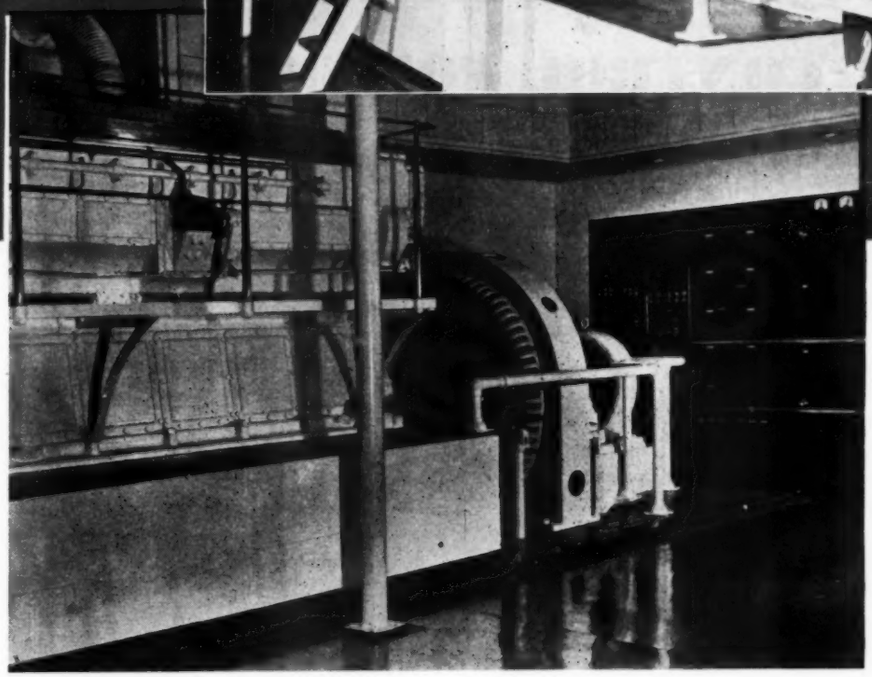
The new towboat, *Minnesota Husky*, is an example of the workboats which typify today's trend. Powered by a 1325 horsepower Cooper-Bessemer supercharged Diesel engine driving a single propeller, she is the most powerful boat of this type in the river trade. The engine is direct reversing, air starting, and features the latest advancements in Diesel design such as patented Cooper-Bessemer pressure relief fuel injection system, Meehanite metal pistons and cylinder liners and through-bolt connected base and center frame.

The new *Husky*, designed by A. M. Deering of Chicago, is 118½ feet in length, has a 30-foot beam and is equipped with all the latest refinements which make for efficiency and comfort. The boat is said to have the power to tow 2,700,000 gallons of gasoline—the equivalent of 270 railroad tank cars—under normal operating conditions. She is owned by the Upper Mississippi Barge Co., Minneapolis, Minnesota.



GAS-FUELED ENGINE SUPPLIES POWER FOR OFFICE BUILDING





A CONVINCING example of how office buildings, industrial plants or commercial institutions of any kind can obtain all their electric power requirements at low cost and with a minimum of maintenance is typified by the unusual power generating installation at the Lone Star Gas Company, Dallas, Texas.

The equipment consists of a seven year old Cooper-Bessemer gas-fueled engine. It is of the 8-cylinder size developing 400 horsepower, and furnishes all power requirements for Lone Star's 13-story Wood Street Building, including lighting and power for the electrically-operated elevators.

Some of the most notable features of this installation are the exceptionally clean characteristics of the power plant room as shown in the accompanying photographs, and the engine's low cost fuel consumption which averaged only 16.5 cubic feet of gas per kilowatt hour for the past year with an average load factor of 66.5.

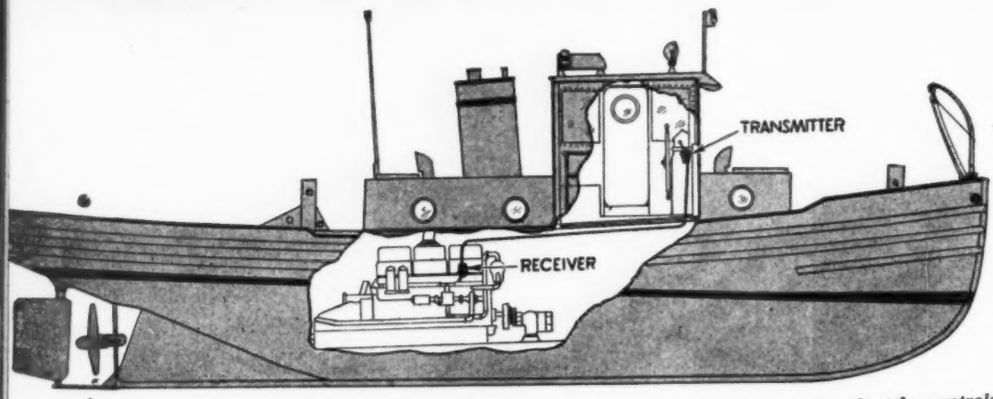
According to the tabulated yearly record of the engine's performance during 1943, the unit's lubricating oil consumption averaged 4,075 rated horsepower hours per gallon for 1943. In commenting on this outstanding performance record, W. F. Gieb, Chief Building Engineer for the Lone Star Gas Company, brought out the fact that although the engine was twice inspected for possible overhaul, the only work required was a grinding of valves and a slight adjustment of the spark plugs. "The original rings are still in good condition," said Gieb, "and the bearings required no attention. In fact, during one 3-year period, the crankcase was never opened."

The engine is cooled by means of a closed system operating through a Carrier evaporative condenser. This condenser is on the roof of a court on the building's second floor. The exhaust pipe is carried up an outside corner of the building to the roof eleven stories. Due to expansion and contraction it was found necessary to mount this pipe with roller supports. A Maxim exhaust silencer is fitted on top of the stack.

One interesting installation difficulty which was overcome concerned a streak of quicksand across one corner of the basement. In order to be sure that no vibration would be transmitted to the foundation or subsoil, the engine was mounted on Korfund Vibro Isolators.

The engine and entire engine room are painted white, except the floor which is a dark green, and is located directly under the Stationery Department of the Wood Street unit. In order to be sure that no noise would be transmitted to the building, the ceiling has been covered with Celotex.

These Cooper-Bessemer engines are convertible from gas to Diesel operation or vice versa, depending upon the availability of fuel at the point of installation.



Cutaway profile of a 45-ft. Diesel Army tug showing arrangement of hydraulic throttle controls.

HYDRAULIC REMOTE CONTROL FOR DIESELS

By J. L. STUART*

WHETHER your Diesel is of the latest design or an ancient relic would make little difference if you could not control its speed. The more accurately and easily you can control an engine's speed, the more efficient is the operation of the engine.

Before the war, various types of remote control installations, (hydraulic, pneumatic, electrical, mechanical, etc.) through usage, had become rather well defined in their respective fields of application, and the limitations of each type were well known to the majority of design engineers. However, the spur of new and widened war-time demands increased both interest and research in this field, and during the last three years hydraulic remote controls have made large gains in range of application and popularity. Of these hydraulic designs, the single tube, balanced remote control and positioning system has been established as a highly efficient and simple mechanism in its field.

This system consists of a transmitter and receiver connected by ¼ in. diameter copper tubing. On the power stroke movement the transmitter causes a downward movement of the transmitter piston, forcing the hydraulic fluid through the tubing, and thereby forces the piston in the receiver unit upward. This upward motion of the piston actuates a rocker arm which, in turn, effects a travel of the receiver lever exactly equal to the initial movement of the transmitter handle. Because this is a closed system, the travel of the transmitter handle and receiver lever is simultaneous.

Spring assemblies, incorporated in both units, produce a constant force on the fluid of the system. This force is maintained throughout the entire working stroke, regardless of piston positions in the units, except when an external load is applied to either unit. Therefore, the transmitter handle can be stopped at any point on its arc of travel and the setting will be retained automatically – without "creep" or "backlash."

Since temperature changes cause volumetric contraction and expansion of hydraulic fluids, design engineers have developed an efficient "synchronizing" feature that eliminates any control movement which might be produced by heat variation, up to the time of synchronization. Both transmitter handle and receiver lever have 55 degrees of operational travel; however, the transmitter handle can be moved an additional 7 degrees at the end of its operational arc, for the purpose of synchronizing. This movement opens a valve, thereby allowing excess fluid to flow out of the system and into the transmitter reservoir, or replacement fluid to flow from the reservoir into the system.

Installation problems are greatly simplified because of the ease with which copper tubing can be bent around, over, or under obstructions, or run through walls and bulkheads. Where mobility of transmitter location is desired, or excessive vibration is a factor that must be overcome, a flexible tubing can be substituted for the copper tubing, thus eliminating the problem entirely.

New Designs Necessary To Meet New Operating Specifications

Compensation for temperature change effects was, at one time, effectively regulated by the afore-mentioned synchronizing feature. However, war-time needs set up more stringent operating requirements in this respect and, accordingly, it became the problem of design engineers to increase the temperature range under which such a system would function efficiently.

Early attempts to develop satisfactory temperature compensation devices involved the use of a reservoir tube that ran parallel to the force transmittal tube, but this eliminated many of the advantages of a single-tube hydraulic system. Numerous other experiments were made in connection with this problem, utilizing metallic bellows, thermostatic bimetals, etc., but all of these added complex accessories, which reflected the changes in temperature at one location only, and lost some of the basic advantages of a single-tube hydraulic system.

Research on the temperature problem extended to all types of remote control systems and these investigations developed the realization that the electrical type of control and the hydraulic single-tube system held many points of superiority over other control types in the field of mechanical application. In recognition of the fact that both of these types of control possess certain inherent advantages, design engineers combined the best features of each and the resulting electro-hydraulic design embodies, in many instances, a solution to the temperature compensation problem.

The electro-hydraulic design shows a method that produces localized "compensation" at the receiver by inserting an electrically operated solenoid valve in a single-tube system. This system is not entirely compensated in that the transmitter handle is still allowed to move in proportion to the change in temperature to which the system is exposed, but the receiver is substantially unaffected.

The solenoid valve is connected directly to the receiving unit and closes or opens the line to flow. To accomplish this opening and closing, the operator grasps the transmitter handle, depressing the push button switch with his thumb. An electrical impulse, resulting from this switch depression, operates the valve, opening the line to flow and allows the operator to move the transmitter handle freely over the entire operational arc of the control. When the operator releases his pressure on the switch, the solenoid valve closes the line, thus preventing any flow of hydraulic fluid, and effectively locks the receiver setting. Therefore, practically all of

* *Technical Editor, Sperry Products, Inc.*

the fluid in the system is contained in the tube between the solenoid valve and transmitter. The volumetric change caused by temperature variation in the small amount of fluid trapped between the solenoid valve and receiver unit is so small that its effect on the setting of the receiver lever is negligible.

If the amount of expansion or contraction of the fluid, during the time the system is locked, has been sufficient to cause a change in the *transmitter* handle position operation of the synchronizing feature (upon releasing the lock) immediately restores the proper transmitter-receiver relationship. This electro-hydraulic system possesses the oft-needed feature of locking the receiver lever in any position against *all* external loads within the rated capacity of the control itself. Another important advantage of this electro-hydraulic combination is that failure of electrical power does not mean loss of control, but merely loss of the locking feature. Immediately coincident with power failure, the solenoid valve returns to its normally *open* position and the control functions as a normal hydraulic single-tube system without a receiver lock.

Use of Hydraulic Control Proved in Diesel Field

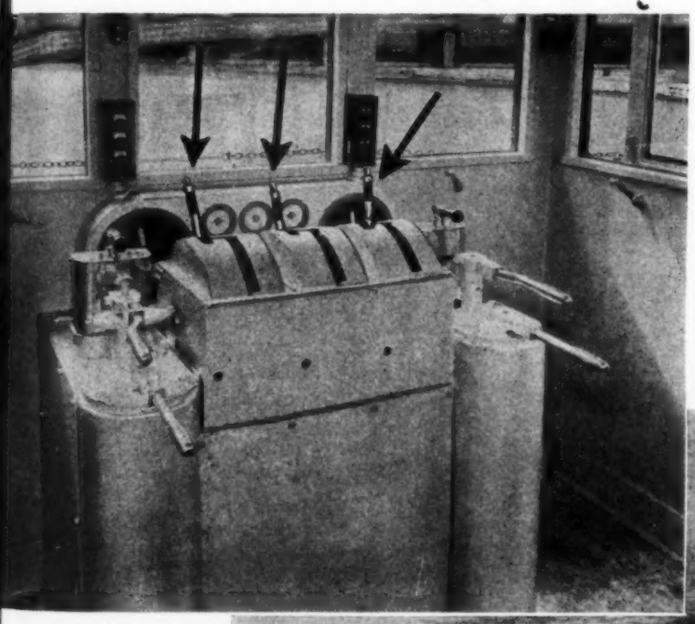
Railroads find advantages in this control where Diesel engines in rail cars and locomotives must be controlled from both ends. This system of hydraulic remote control is incorporated in a number of Diesel rail cars that are being built by Whitcomb Locomotive Company, H. K. Porter Locomotive Company, and are installed in a number of locomotives used by the Bethlehem Steel Company, U. S. Navy Yard, Philadelphia, Pennsylvania, and Missouri Pacific Railroad.

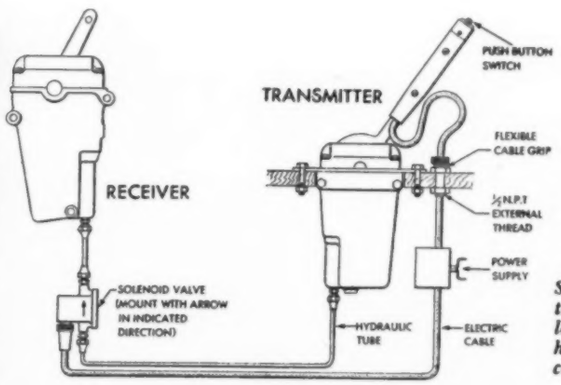
In the marine field, Diesel engines, electric generators, refrigerator plants, engine room telegraphs, etc., may be controlled accurately from a central station on ships. Successful applications of the control on marine engines have been made by the U. S. Navy in motor torpedo boats, and by various Diesel engine manufacturers.

Walter W. Haertle, designer for the Kewaunee Shipbuilding & Engineering Corporation, of Kewaunee, Wisconsin, used this control on a number of all-steel Army tugs. These boats were originally designed with mechanical controls which were replaced by hydraulic units, thus cutting the installation time from 9 hours to 40 minutes for each vessel. Kewaunee also used this control on the new fish tug, *Oliver H. Smith,* built for Smith Brothers, of Port Washington, Wisconsin. The ease and accuracy with which these controls operate the 165 horsepower Gray Diesel has won much favorable comment.

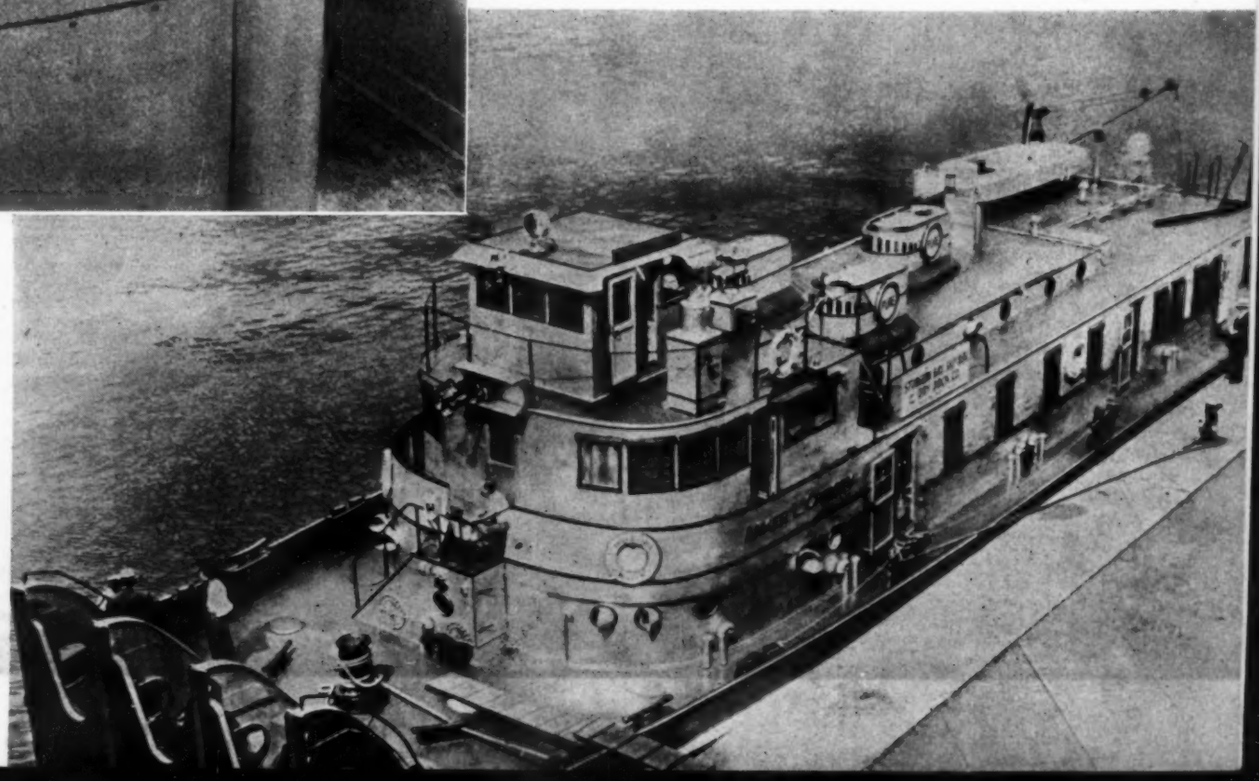
The Sterling Engine Company, of Buffalo, New York, has selected these controls as a means of obtaining speed adjustment via governor control for their new Viking Diesels.

A summary of the foregoing shows that these controls are widely employed in the field of Diesel engineering, and their enthusiastic acceptance points to still wider use in connection with the most modern of engines.

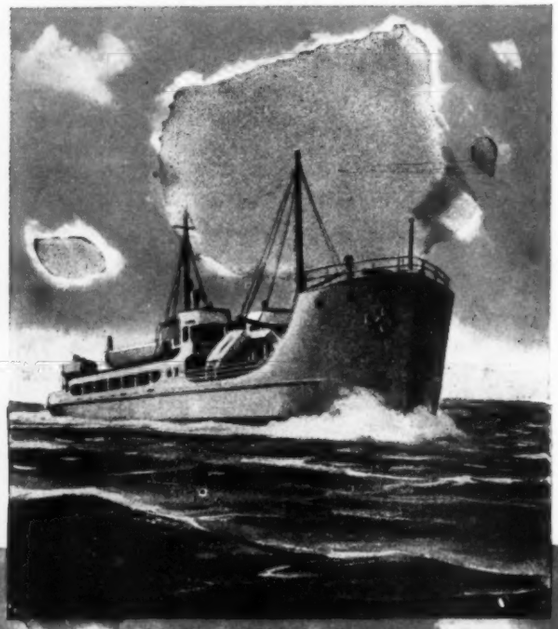




Schematic layout of the electro-hydraulic lock as applied to hydraulic remote control.



Right: The triple-screw towboat, "Anker L. Christy," powered by three 400 hp. Cooper-Bessemer Diesels which are operated by single line hydraulic controls, shown above.



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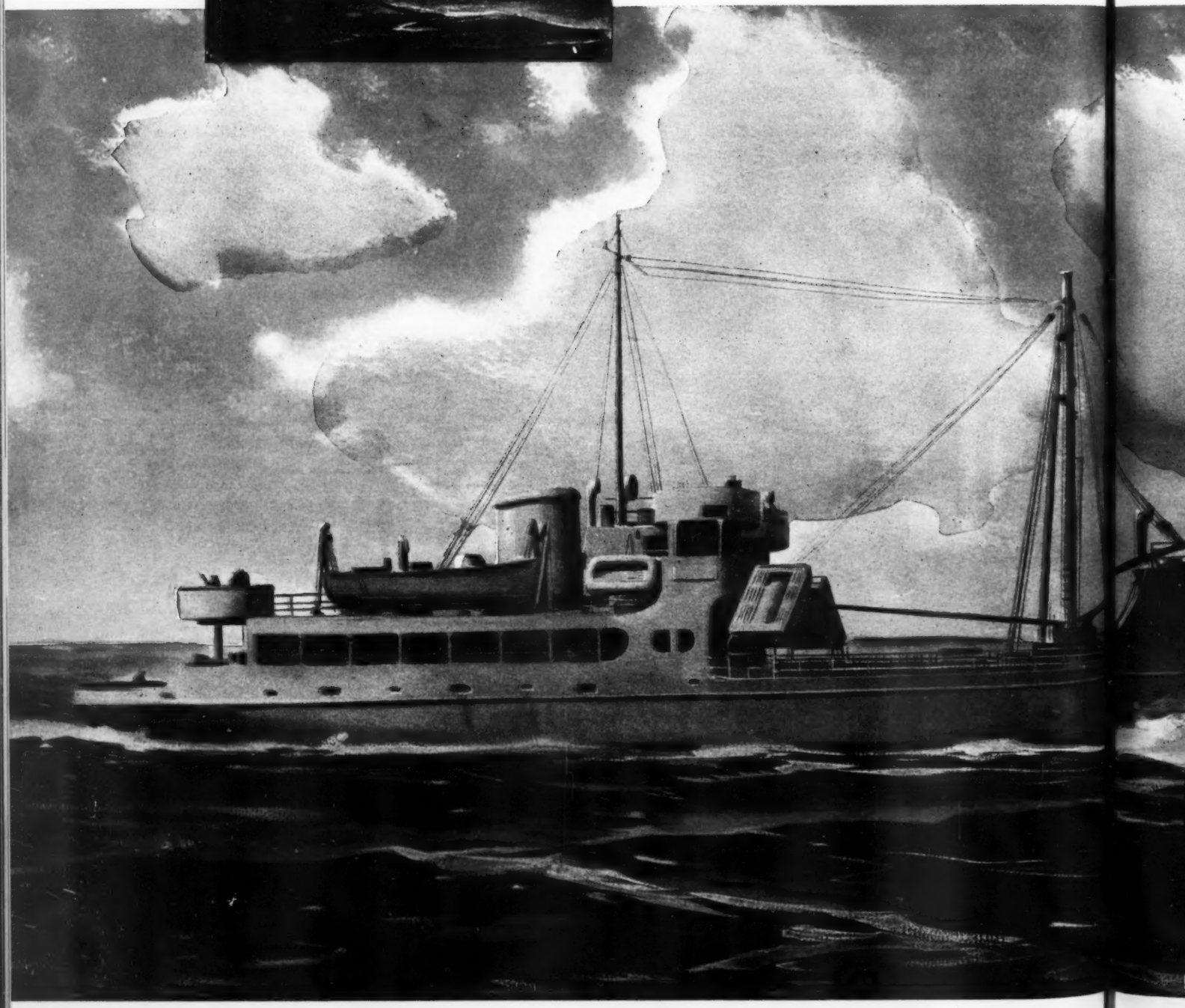
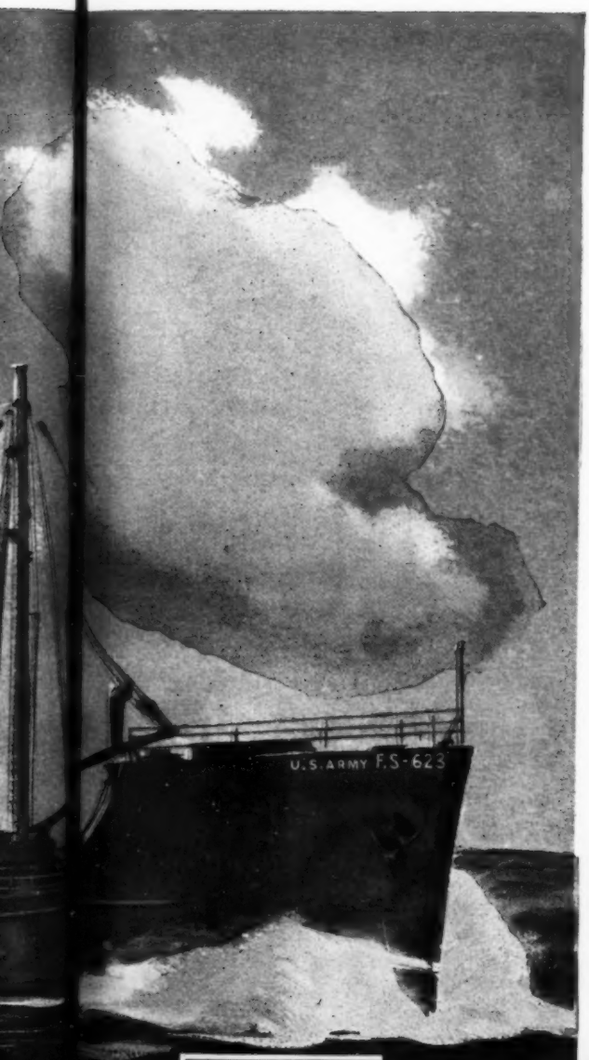


KEEP AMERICA STRONG BUY

...the Army's Navy, too



This is one of a fleet of vessels recently built for the U. S. Army Transportation Corps. Powered by General Motors Diesel engines.

GM
GENERAL MOTORS
DIESEL POWER

ENGINES..150 to 2000 H.P. **CLEVELAND DIESEL ENGINE DIVISION,** Cleveland 11, O.

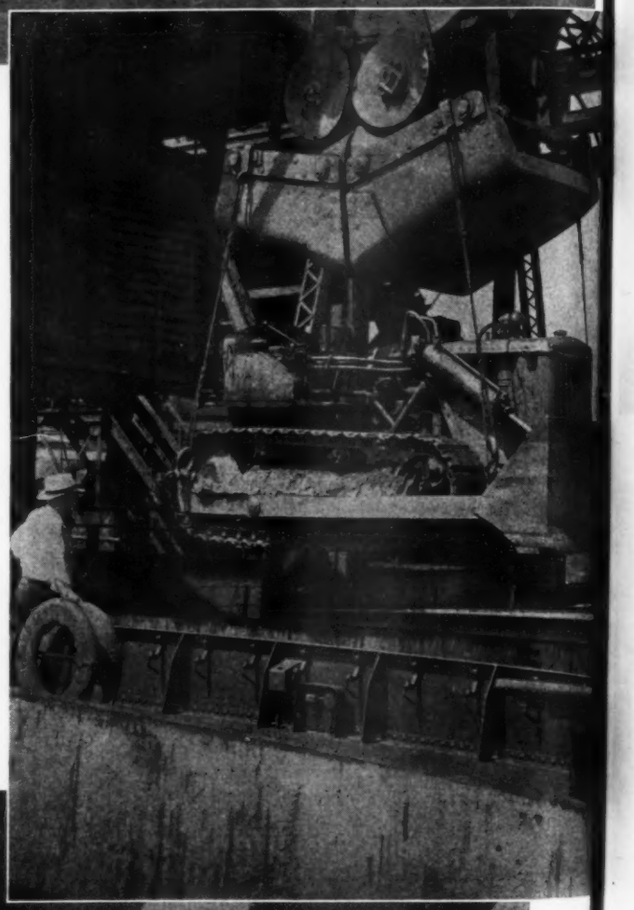
ENGINES.....15 to 250 H.P. *DETROIT DIESEL ENGINE DIVISION,* Detroit 23, Mich.

LOCOMOTIVES..... *ELECTRO-MOTIVE DIVISION,* La Grange, Ill.

ORE UNLOADING SPEEDED BY DIESELS

By JIM MEDFORD

STEEL tanks, guns and boats have their origin in the depths of the earth. The iron ore that is the basis of their structure, in the majority of cases, comes to the high temperature furnaces in giant vessels—floating ore bins. At the Youngstown Sheet and Tube Company's Indiana Harbor Works, East Chicago, Indiana, one of the Interlake Steamship Company's 620-ft., 16,000-gross tons freighters is shown discharging her cargo with the help of a Diesel tractor with bulldozer. The tough clamshell bucket works through ore cargo to hold deck, the Diesel "Cat" speeding up the ship's time in dock by keeping plenty of ore within reach of the massive jaws of the 24,000-pound capacity self-loading bucket. Each extra trip means that much more steel for both war fronts—and it's needed!



Crankcase Explosions—Continued
Part 2

Conducted by R. L. GREGORY

CONTINUING the discussion of the above subject, the first installment of which appeared last month, let me again refer to Mr. Faast's article on the subject, which appeared in the December issue, wherein we find the following: "When slight scoring occurs from high spots located low down on the piston surface, the resulting hot sparks entering the crankcase will cause detonation, if the crankcase gases are up close to their flash temperatures and contain air in explodable quantities."

In referring to this statement we must remember that Mr. Faast was discussing the subject of wristpins, as being responsible for the majority of crankcase explosions. Of course he was referring to units with trunk-type pistons. The writer is viewing the subject from the angle of the crosshead type units, thus giving our readers both sides of the question as applied to both types of units. The above statement as made by Mr. Faast is absolutely true in the case of the trunk type piston.

However in the crosshead type of unit, with no wristpin in the piston trunk, the high spots which do develop on the piston surface, usually occur at the top of the piston skirt adjacent to the lowest ring. This is the natural focal point for these high spots to occur. As rings become faulty, causing blowby, the heat of combustion traveling down the piston surface, naturally hits the top of the skirt first, with resultant high spots developing at that point.

When such a situation arises, and high spots start to develop, unless immediate steps are taken to overcome the trouble, such as cutting out the fuel supply to that particular piston, or shutting the unit down immediately, the expansion of the piston will cause these high spots to rub the liner walls. The excessive heat will destroy lubrication, and immediately scoring starts to take place. The question now arises as to where this scoring first takes place. Answering upon the spur of the moment one might say, that it will occur the full length of the stroke on the cylinder wall. But such is seldom the case.

In this type of unit scoring first occurs near the bottom of the liner at the point of least wear. If you have ever taken the pains to mike up the wear on a liner in this type of unit, you will find the greatest wear at top stroke, gradually diminishing as you go down the liner until you reach bottom stroke position. At this point you will note the least amount of wear, hence the least tolerance between piston and cylinder wall. Another point which must be taken into consideration is in the design of most units of this type; the cooling chamber, which retains the cooling agent, does not extend clear to the bottom of the liner, hence the heat transfer at the bottom of the liner is not as positive as it is on the sides and at the top, where the cooling agent comes in closer contact with the liner walls.

With these two conditions in mind, one can readily see why scoring will start at the bottom of the liner, when the high spots at the top of the piston skirt are at bottom stroke. This of course applies to the crosshead type unit. And since scoring means the development of hot sparks, they are in very close proximity to the crankcase gases rising from the crankcase. Here then you have a perfect set-up for detonation, providing temperatures and other conditions are such as to set off the detonation. In either type of unit therefore the conditions are similar.

The question now arises as to what methods should be adopted to prevent such explosions. Let us keep both types of units in mind while determining these points.

(1) First comes the question of forced ventilation of the crank case, and this has long been a point of argument among Diesel designers. As Mr. Faast stated in his article, "Air must be present in explodable quantities in order to have a detonation." He also stated, "If the proportion of air is not within this range, chances are some local combustion or unnoticed detonation will occur and be damped out by lack of air." Therefore why add to the quantity of air by forced ventilation? Some designers believe that by forcing air through the crankcase you will remove the gases. That too sounds plausible, but there are always pockets from which these gases are not forced and therein lies the disadvantage.

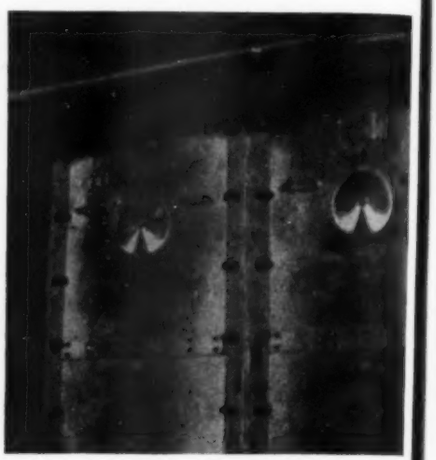


Fig. 1. Crankcase Safety Valves.

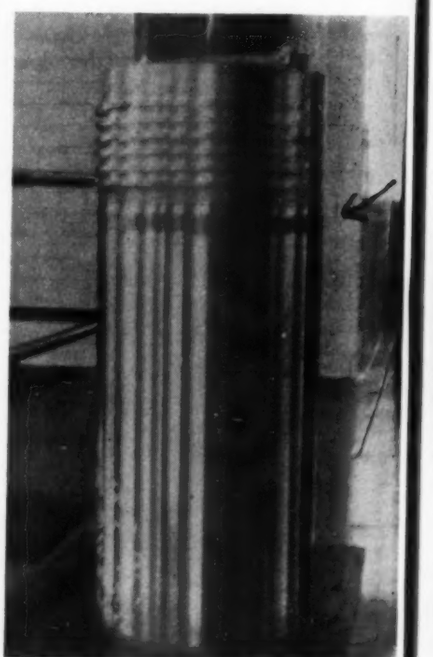


Fig. 2. Piston With Soft Metal Band.

The writer's personal opinion is, that those designers and manufacturers who are endeavoring to create and maintain a partial vacuum in the crankcase by means of breathers, tracifiers, ... *And now please turn to page 88* . . . .

Exchange Your Diesel Maintenance Ideas

Conducted by R. L. GREGORY

Editor's Note: In this department we provide a meeting place where Diesel and Gas engine operators may exchange mutually helpful maintenance experiences to keep our engines in top condition. Mr. Gregory edits your material and adds constructive suggestions from his own wide experience. This is your department—mail your contributions direct to DIESEL PROGRESS.

Repairing Crystalized Crank Pin Bearing

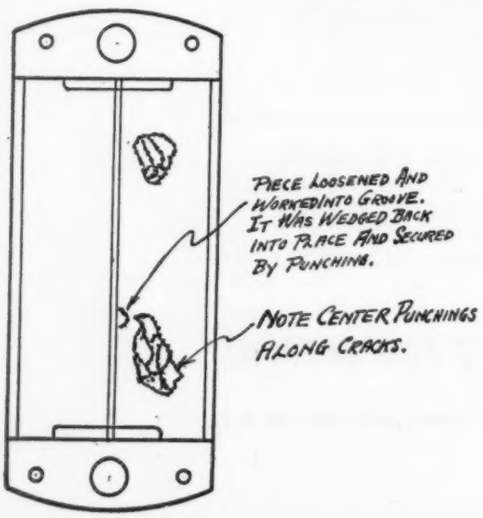
MR. M. L. MONSON, Supt. Municipal Power Plant, Fosston, Minnesota, writes:

"I have read with interest the different articles which have appeared in the DIESEL PROGRESS as to how crystallized crank pin bearings have been repaired.

"A year ago, a crank pin bearing on one of our Diesel engines became crystallized on two spots. The pieces were loose but not so that they would fall out. The writer decided to wedge the small pieces together by means of a center punch. The punch was tapped very lightly and the punches were close together. The surface where these cracks appeared was then smoothed and cut down just slightly below the bearing surface.

"We inspected this bearing a few days ago and found that it was the same as when we repaired it a year ago. We expect to get many more hours of service from this bearing."

Method of repairing crank pin bearing.



Track Pin Gun—A Useful Gadget

MR. LEONARD E. GAINER, War Production Training Machinist Instructor, Lebanon, Oregon, writes:

"This maintenance idea doesn't deal directly with gas or Diesel engines but is a great help to the Burt Gainer Logging Co., for which I have driven a Diesel logging 'Cat.' This company operates D8 Caterpillars and Bucyrus Erie Crane. It was used in emergency cases where the 'Cat' track links had broken, making it impossible to move the tractor and with no hydraulic press available to remove the track pins, assembled at 20 tons pressure.

"Obtain a piece of shafting 6 in. to 8 in. in diameter and 14 in. to 18 in. long for the barrel of the gun (the extra weight helps to back up the gun). The piston can be made from a large truck axle. This material is preferable due to the tough steel of which it is made and helps to prevent swedging on the end that is placed against the track pins. This piston is turned at least ⅛ in. to ¼ in. smaller in diameter than the diameter of the pins in the track links. This turned portion should be 6 in. longer than the length of the track pins. The head of the piston can be larger than the track pins. The one now in use is 2-3/16 in. diameter (piston head). The rest turned down to 1½ in. diameter. The 2-3/16 in. diameter is about 1½ in. to 2 in. long. This holds the piston straight in the barrel.

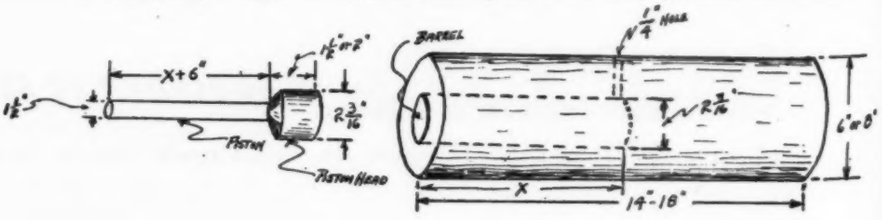
"The hole bored or drilled in the piece of 6 in. or 8 in. diameter stock should be at least .010 in. over piston head size. Then drill ¼ in. hole from the outside intersecting the barrel at the very back end.

"This gun should be used by persons understanding the use of powder. It is best to start with a small charge rather then too large. (1) place about 1/12 of a stick of 20% stumping powder in the barrel. (2) place the piston in the barrel and (3) slide the piston back to or near the end of the stroke. (4) align the gun and piston for length and parallel to the track pin or object to be forced out. It will lay on blocks of wood to obtain height but the piston should be placed against the track pin. This helps to eliminate swedging of the small end of the piston. (5) Place a No. 6 cap on the end of enough fuse to allow the operator time to retire to a safe place. (The fuse we have been using allows 1 minute per foot of fuse. A battery hook up could also be used.) (6) After installation of the cap to the fuse, slip the cap combination into the combustion chamber through the ¼ in. hole at the back end of the barrel. Care should be taken not to apply pressure on the piston after the cap and fuse combination have been inserted. Any pressure applied to the cap below the powder line can cause the cap to explode.

"This method has been used by the Burt Gainer Logging Company for 5 years, to replace pins as well as to remove them. In replacing pins a heavy piece of steel is placed at the point at which the pin is to stop. When the pin butts up against this bucking bar the motion of the pin is halted immediately. The above amount of powder (stumping) has been estimated to produce approximately 30 tons pressure.

"We consider this unit safe to use underneath the cat, shovel or other power equipment, and recommend it be treated with the respect shown any other firearm. I hope this will be of use to you and the readers of DIESEL PROGRESS. I enjoy the magazine, and will be pleased to volunteer any assistance I can to anyone desiring additional information."

This simple gun might be useful in field repairs where heavy pressures are needed.



TRACK PIN GUN

A Simplified SK Strainer . . .

designed to give you more for your money

Here is a duplex strainer which does a thorough job of removing dirt and other foreign matter from oil, water and other liquids, *yet is moderately priced.*

Check These Features:

DUPLEX DESIGN—
Permits cleaning without flow interruption.

ONLY 1 VALVE—
Single shut off cock provides continuous flow during switchover and is pressure balanced for easy operation. Steel spring takes up any plug wear and insures against leakage.

VERTICAL BASKETS—
Allow continuous flow while cleaning. Dirt is collected in basket which is easily removed without loss of fluid. Strainer free area is a minimum of 5 times pipe area.

SINGLE-SETSCREW CLAMPS—
Quickly removable, yet seal basket chambers tightly.

PACKING GLANDS—
Nut-and-stud type, easy to adjust and will not corrode and "freeze."

PLUG DRAINS—
On basket chambers, provide convenient arrangement for draining fluid from unit.

Made of cast bronze, these SK Duplex Strainers are designed for pressures up to 125 psi, in pipe sizes from ½ to 2 inches. Being light-weight, they need no support other than the pipe line.

Other SK Strainers are made in cast iron up to 250 psi or steel for pressures up to 600 psi and sizes up to 6 inches.

SK FLOW INDICATORS

. . . save time, trouble and expense

Positive flow information in critical sections of pipe lines is provided by SK Flow Indicators. Power may be conserved, a continuous process may be kept in operation and damage to expensive equipment may be prevented.

Cast bodies, available in red brass or meehanite iron, are designed to withstand the same pressures as extra heavy pipe fittings. Glass is tempered plate, thermal-shock resistant, and being at least ½ inch thick is practically unbreakable. Indicating vane is rotary type of light plastic, corrosion resistant and almost frictionless.

For use in any position at pressures up to 250 psi and temperatures up to 250° F., these Flow Indicators are supplied in pipe sizes from ½ to 2 inches, inclusive.

Flapper type Flow Indicators having glass on one or two sides are available in pipe sizes from ½ to 3 inches, inclusive.

SCHUTTE & KOERTING COMPANY
Manufacturing Engineers
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JET APPARATUS • CONDENSERS AND VACUUM PUMPS • HEAT TRANSFER EQUIPMENT • VALVES • ROTAMETERS
FLOW INDICATORS • GEAR PUMPS • STRAINERS • OIL BURNING EQUIPMENT • SPRAY NOZZLES AND ATOMIZERS • RADIAFIN TUBES

Cummins Appoints Fred W. Sparks As New Regional Manager

CUMMINS Engine Company, Inc., Columbus, Indiana, manufacturers of Diesel engines for automotive, industrial and marine applications, has announced the appointment of F. W. Sparks as manager of the Cleveland Region. This region includes Ohio and Michigan.

Fred W. Sparks

Mr. Sparks has been a member of the Cummins sales department for several years, most recently having been located at the home office. He is widely acquainted among the manufacturers of industrial and automotive equipment, many of whom are located in the Cleveland area.

When in Cleveland, manufacturers and their representatives are invited by Mr. Sparks to make their headquarters at the Cummins offices, where every possible assistance in making train or hotel reservations and in arranging other accommodations will be provided.

Robert Bland Named Assistant Advertising Manager

SEVERAL changes have been made in the Advertising Department, according to an announcement made public by George W. Stout, Advertising and Publicity Manager of The Perfect Circle Company.

Robert Bland has been named Assistant Advertising Manager, taking the place vacated by Martin Davis six weeks ago. Mr. Bland is well qualified for his new assignment, having been supervisor of advertising production for many years and employed with the company for almost 17 years.

Railroading Soldiers,

continued from page 43

laughing. "The morning after we landed, a trainload of ammunition, gasoline and food pulled into our railhead. Two days later we began handling special supplies flown to us by air and the next day trucks arrived. Everyone just used his common sense and all the energy he could muster. Things went fine."

The supply depot and the boat repair jobs were a far cry from railroading but they were adding to the kick that eventually knocked the German Army out of North Africa. It wasn't until Bengasi had been captured that all of the men of the 760th were doing railroading work.

A railroad supply line from Bengasi to Barce to Saluk—eventually called the Bully Beef Special in honor of English cousins who provided a good deal of that delicacy to eat—had to be opened. Tank battles in the desert demanded tremendous quantities of gasoline, ammunition and food and the 760th was given the job of getting them there by rail.

"We all realized that getting the railroad going was a pretty serious job," said Technician Fourth Grade John Karsko of Moosic, Pennsylvania, "but we figured to have plenty of laughs, too, even though only a couple of us had ever done any staff operating.

"When we arrived at Bengasi, a railroad was waiting for us but what a railroad! All the locomotives were steam powered, condemned by the British Army and guaranteed not to run except by a miracle man. Some of them had been blown up by the retreating Germans and others were just too old to do anything but collect rust."

Slightly discouraged but still determined after first sight of the new project, Technical Sergeant Wayne Rush of St. Louis, Missouri and Master Sergeant Arthur Councill of Minden, Louisiana, began putting the engines in shape. Every soldier who had ever handled a piece of pipe was qualified as a steam fitter and was put to work repairing the steam locomotives. The others tackled the job of renovating a half a dozen worn out German and Italian Diesel-electric cars.

"They put me in charge of the yards," Sergeant Karsko said. "I guess we didn't do things the usual way. A civilian switchman would have had heart failure if he ever saw how our gang switched those dinky '40 and 8' box cars around. We had a system so complicated that when the yard got crowded with cars, I was afraid to go

out of the office. Those cars went in all directions."

The Bengasi-Barce-Soluk Railroad, operating night and day, put war supplies out of Bengasi at the rate of 1,000 tons every 24 hours. When wrecks knocked a locomotive out of operation they would drag it to the home shop, tear it down, rebuild it with parts from other wrecks and have it back on the rails in less than a week.

When the 760th left Africa at the end of the winter 1943-1944, it went to Italy. In May, 1944, the whole outfit assembled near Naples for the first time in 27 months. The men weren't operating a railroad or fixing boats or keeping store at a supply dump anymore. They had begun the job they're doing today—maintaining every Diesel-electric locomotive on the Italian mainland and coming up with a little inventing on the side to make that possible.

"The operating battalions have been having trouble with the cylinder heads on these Diesel-electric engines and we're trying to straighten it out," Corporal Maurice Hodge of Corbin, Kentucky, explained. "Of course, our outfit isn't equipped with the machines to make new ones but that's working out all right. Our boy, Sergeant Councill, has figured a way to build heads from sheet steel. Aside from maybe revolutionizing the Diesel manufacturing business, this is keeping American locomotives on the tracks and we figure that's something. It makes it possible for us to do what we've been told is the job we have to do to help win the war."

The Busy . . . Bees

NAVY Seabees at a Pacific base built this tester for injection nozzles of Diesel engines from a salvaged hydraulic jack and scrap pieces.

Nozzle tester assembled by Seabees using scrap parts.

The lifting cylinder and the cylinder wall were removed from the shell of the jack. A piece of 1¼-inch iron pipe was welded into place on the base of the wall, and from it, at right angles, another piece of pipe tapered to the shut-off valve. The gauge, which has a capacity of 3,000 pounds, was attached to a smaller piece of pipe which entered the cross-piece at the top of the cylinder pipe.

As Diesel oil would be ejected constantly as tests were made, a reserve oil tank was welded on the side of the outer shell of the cylinder, and an opening left in the tank to receive oil when the supply in the reservoir and shell became exhausted. This auxiliary tank doubled the normal capacity of the reservoir in the shell. The tester operates much like a hydraulic pump. Operation of the pump handle sends the oil from the shell reservoir into the cylinder. The pressure is recorded on the gauge until the injector nozzle's spray breaking point is reached—usually about 1,750 pounds. The size of the adaptors from the shut-off valve vary to fit the particular make of nozzle being tested.

Crankcase Explosions,
continued from page 68

etc., to remove air and keep it below the explodable quantity, are working along lines much more preferable than trying to remove gases by forced ventilation. Forced ventilation would be all right if it were possible to remove all combustible gases, but this seems to be a difficult objective to obtain. Creating a partial vacuum not only removes air, but also combustible vapors. It still remains a matter of opinion with exponents on both sides. However in either case, both methods require additional material and equipment as well as care and attention.

(2) In either type of unit careful checking of the unit must be made periodically to eliminate any causes of blowby, and also to ascertain that the cooling agent is functioning properly through all parts of the cooling system.

(3) Whenever inspections are possible, pistons and liners should be inspected for roundness, highspots, and scoring, and corrections made where found.

(4) Lubrication should be watched continuously by operators on their rounds. Backpressure building up in lubricators is an indication of plugged oil lines, check valves, or lubricating ports in the liners. Forced feed lubricators should flow freely at all times, when in operation. Good lubrication insures longer life and less friction.

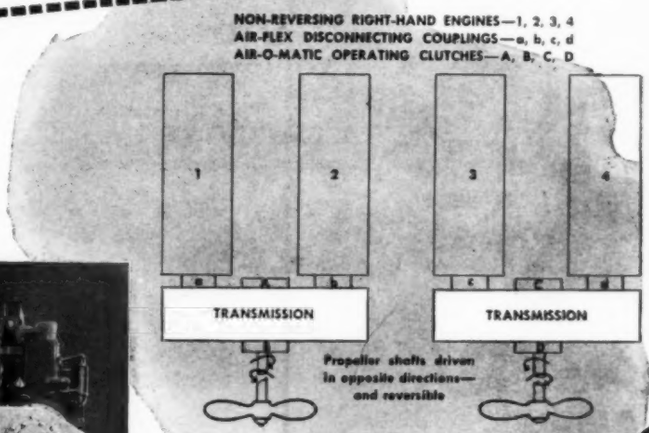
(5) A good system of oil filtration should be used on all lube oil.

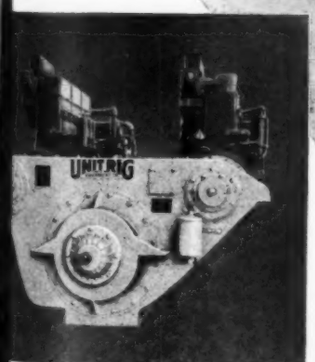
(6) The crankcase should be kept clean and free from foreign material

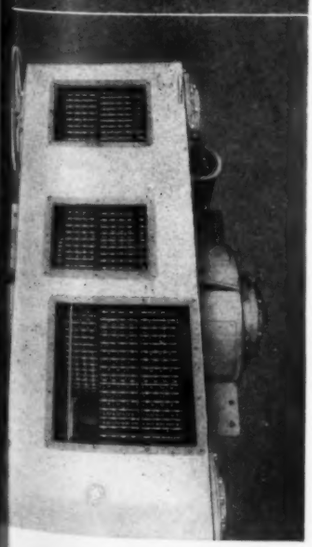
(7) Several mechanical devices have been made to overcome the damage of crankcase explosions. Notably among these are the safety valves placed in the inspection doors as shown in Figure 1. These are called the Marine type of door and are used almost exclusively on marine units as well as on many stationary jobs. This valve can be noted at the top of the door and consists of a circular plate, which seats firmly on a gasket to prevent oil leakage. A stud bolt fastened to this plate passes through a bracket on the rear side of the door, then through a tension spring. At the end of the spring a plate is installed and the tension on the spring adjusted by means of a nut which compresses the spring to the desired tension. This is usually set at from two to three pounds. When there is a detonation the valve acts as a pop valve and releases excess pressure from within and thus eliminates the possibility of damage within the crankcase or to the inspection doors.

(8) Some manufacturers have adopted another feature in piston design as shown in Figure 2. This consists of dovetailing a soft metal band in the skirt of the piston which is several thousandths larger in diameter than the finished diameter of the piston skirt. When high spots do occur upon the piston and expansion takes place, this metal band will act as a guide and being softer than the piston metal proper, will not score the liner or piston in the harsh manner in which it otherwise might be affected. Now there are many other features which might be discussed on this subject of crankcase explosions, and this section welcomes any comments from our readers, since it is one of importance to us all. The main thing to keep in mind to avoid detonations in the crankcase, is to eliminate any causes of such detonations, or any conditions which might lead to them. This requires rigid and punctual periodic inspections.

CARGO CARRIERS
Ship Propulsion Problem—







Solved with Roller Chain Drive Transmissions

● When Higgins Industries, Inc. took on the big job of building a fleet of twin-screw, 170-foot Cargo Carriers for the Army—in a hurry—it was necessary to develop special transmissions—also in a hurry—with which to drive each of the twin-screws, right-hand and left-hand, from two right-hand, high-speed, non-reversing engines—four engines per ship—with full-power, quick reversal—and with ample space between engines for servicing.

Compact roller-chain transmissions to meet these unusual requirements were developed promptly—approved by American Bureau of Shipping—and were ready for installation when the hulls were completed. Engineers of Unit Rig and Equipment Company, Tulsa; and Diamond Chain and Manufacturing Company, Indianapolis; collaborated on this job—Unit Rig with a background of wide experience in designing and building modern, high-speed, oil field drilling rigs, transmissions, and servicing units—and Diamond with more than half a century of experience in applying drives to all types of machinery and mechanisms.

The quiet and compact roller chain drives of these transmissions provide lasting high efficiency, outstanding durability, and great reserve strength. Loads being divided among many teeth, and being sustained at the roots of the teeth—not at tooth ends—these flexible drives are capable of continuing in operation in spite of possible damage as a consequence of exigencies of service which might completely disable other types of transmissions for which maintained perfection and rigidity of installation are essential.

Recommendations for *your* drive requirements are yours for the asking. DIAMOND CHAIN AND MANUFACTURING COMPANY 407 Kentucky Avenue, Indianapolis 7, Indiana. Offices and Distributors in All Principal Cities.

DIAMOND ROLLER CHAINS

Twin Disc Announces Opening of Regional Office in Michigan

G. M. (Ted) Guilbert has been appointed manager of the Twin Disc Clutch Company's newly-created regional office at Lansing, Michigan, according to an announcement by N. F. Adamson, general sales manager for Twin Disc. The new territory formerly was served from the Cleveland regional office.

"This new office has been established," Mr. Adamson stated, "in order to better serve the many Michigan manufacturers who are greatly expanding their use of our hydraulic drives, industrial clutches and marine gears in their products."

Mr. Guilbert is a 20-year veteran with the Twin Disc Clutch Company, having served this concern in various important executive capacities. Due to his wide acquaintance among manufacturers and his intimate knowledge of Twin Disc products and their applications, he was considered an ideal choice for this important new assignment. Just prior to his appointment as manager of the Michigan region, Mr. Guilbert completed an extensive nation-wide survey to determine the future requirements of equipment for the transmission and control of power in industrial applications.

New Booklet for Ranchers

HOW West Coast ranchers benefit by using modern machinery for intensive farming, irrigating, and land clearing is the subject of a new booklet recently issued by Caterpillar Tractor Co.

Many pictures show this modern power equipment at work on western ranches—plowing summerfallow, disking in orchards, harrowing potato ground, plowing flax, etc.

Write *now* to Caterpillar Tractor Co., Peoria, Illinois, for your free copy of Form 8814, "Ranching With Diesels West of 110°."

F-M President's Cup Goes To Dallas Branch

THE Dallas, Texas, branch of Fairbanks, Morse & Co., was presented the company's President's Cup Jan. 26, in recognition of having a larger volume of business than any other branch in 1944 in relation to its annual quota.

Shown, left to right: Robert H. Morse, Jr., general sales manager; Col. Robert H. Morse, president, who presented the cup; Harry J. Renken, manager, Dallas branch; and R. H. Matthews, who topped the list of Dallas field engineers in sales.

Presentation was made by Col. Robert H. Morse, president, to Harry J. Renken, manager of the Dallas branch. Both Manager Renken's name and that of R. H. Matthews, who topped the list of Texas field engineers, were engraved on the cup. This is the first time the cup has been won by a Southern branch since the presentation was inaugurated 12 years ago.

Colonel Morse paid warm tribute to the South in his presentation. America is expecting great things from postwar Texas, he said. He predicted a program of development of natural resources and of diversified agriculture possibly without parallel in American history.

ALUMINUM PISTONS discipline heat

There comes a time when even *aluminum* pistons cannot perform satisfactorily uncooled. Supercharging and higher engine output have added to the heat load that pistons, cylinder heads and liners have to carry. Oil-cooled aluminum pistons are indicated.

The versatility of aluminum in the foundry and forge shop permits piston designs using any of three basic methods of cooling. These are: (1) spray cooling, (2) slosh or "cocktail shaker" cooling, and (3) coil or "direct flow" cooling. Each method has merit; engine operating characteristics will dictate the correct one to use.

Proper cooling eliminates piston ring sticking. Closer skirt clearances are possible, and the general temperature level of the piston is reduced—all desirable conditions, tending to insure long, trouble-free service. Subject to WPB approval, Alcoa Aluminum is again ready to meet the requirements demanded by advanced engine designs. ALUMINUM COMPANY OF AMERICA, 2141 Gulf Building, Pittsburgh 19, Pennsylvania.

ALCOA FIRST IN ALUMINUM

Nordberg Host to Educators

NORDBERG Manufacturing Company was recently host to a group of departmental heads of Mid-West engineering schools. This was the first of several meetings to be held in Diesel engine manufacturing plants inspired by the Diesel Engine Manufacturers Association as part of the educational program of that organization.

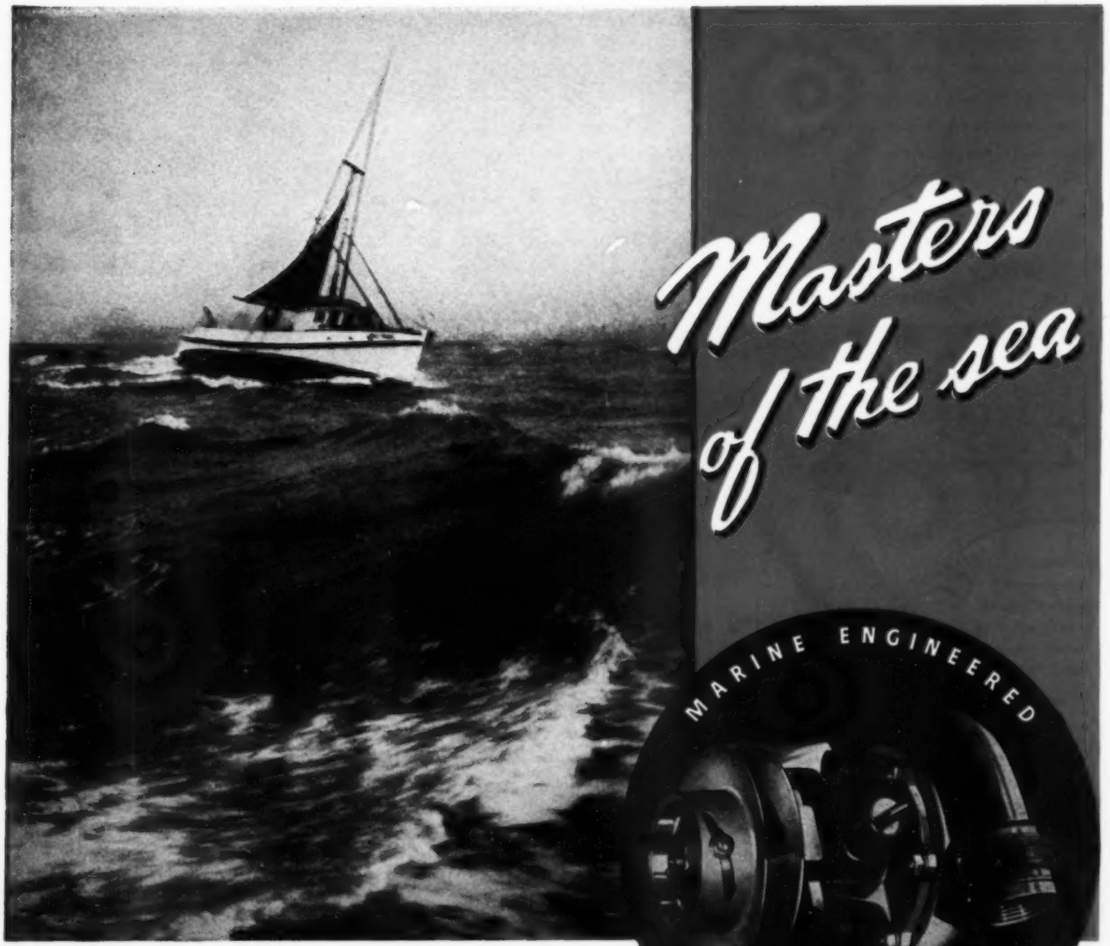
The purpose of the meeting and the program as arranged covered the following points: To acquaint heads of engineering schools with the facilities of Nordberg for Diesel engine manufacture; to note the recent progress made by the Diesel engine in meeting wartime needs; to learn of postwar plans and developments; to obtain a better understanding of the needs of the Diesel engine manufacturer for competent engineering graduates to work on the design, testing, and development of Diesel engines.

At a noon luncheon, the guests together with Nordberg executives were greeted with an address of welcome by Robert E. Friend, Presidtnt of Nordberg. Short addresses were also made by C. E. Stryker and E. C. Bayerlein, Vice Presidents of the company, the latter covering the history and achievements of Nordberg gleaned from his more than fifty years of association with the company. The afternoon session was devoted to a display of educational material consisting of films, slides and engine parts prepared by Nordberg for Diesel training.

Baldwin Host to Educators

FOLLOWING the pattern set by DEMA, Baldwin Locomotive Works also played host to a large group of educators representing Eastern engineering schools, shortly following the Nordberg meeting. The day was packed with interest, centered, of course, on Baldwin's Diesel Division and highlighted with an inspiring talk by Charles E. Brinley, Chairman of the Board. The inspection tour included the new Diesel department where they are turning out 50 engines per month, a look at the Pennsy's new direct drive turbine locomotive, the strain gauge department, the water wheel laboratory, and the Diesel-electric locomotive department. The group was shown a sound slide film prepared by Baldwin covering the service routine for Diesel-electric switchers.

Snapped on inspection tour of Baldwin Shops.



SKIPPERS who battle the sea in storm-tossed boats rely on both seamanship and dependable equipment to bring ship and crew safely back to port.

That's why they choose equipment designed and built by men who put dependability above everything else when it comes to marine products. All M-P equipment is marine engineered and built to rigid U. S. Navy standards. That means it's got to be *right.*

MARINE PRODUCTS CO.

6636 CHARLEVOIX AVE. DETROIT 7, MICHIGAN

"Pitchin' out the sea" . . . in fact the seven seas . . . is the wartime job of M-P centrifugal pumps in all types of amphibious "beach-busters," landing craft, tanks, tractors and small naval craft . . . keeping 'em floating through shell fire and surf.

Marine Products production has met every navy and army demand, on time, while producing M-P pumps and other marine-engineered equipment for fishing vessels, work boats and other essential commercial craft. Ask your nearest marine supply dealer or write for literature.

MARINE ENGINEERED EQUIPMENT

George T. Badger Heads Sales Of Diesel Specialties and Parts

APPOINTMENT of George T. Badger of Chicago as chief sales engineer of the Paxton Diesel Engineering Company, newly-formed subsidiary of the Paxton-Mitchell Company at Omaha, Nebraska, was announced late in January by James L. Paxton, Jr., president of both companies.

Mr. Badger comes to his new position after 13 years with the Minneapolis-Honeywell Regulator Company. For the past five years he has been sales engineer in charge of railway controls market development and previously was manager of the company's Indianapolis branch. He is an engineering graduate, Purdue University.

Mr. Badger will direct market development of Diesel specialties and parts manufactured by the Paxton Diesel Engineering Company, which will also maintain a Diesel repair service for railroads and other operators of Diesel engines.

George T. Badger

Instructions on Evaporative Cooler for Diesel Engines

A NEW bulletin—Instructions No. 3035A on the Fairbanks-Morse Evaporative Cooler for Diesel Engines has been issued by Fairbanks, Morse & Co. This 36-page booklet covers operating principles, design, auxiliary equipment, installation, construction, maintenance, specifications with numerous illustrations and diagrams and a complete tabulation of repair parts. It is essentially an engineering bulletin on Evaporative Coolers rather than a sales bulletin and is therefore offered at $1.00 per copy. Write Fairbanks, Morse & Co., 600 South Michigan Ave., Chicago 5, Illinois.

1944 DIESEL PROGRESS Editorial Index

A COMPLETE index of all editorial material which appeared in the 1944 issues of DIESEL PROGRESS is now available. Included is a cross index of authors and articles. Feature articles are covered by title; news notes are indexed by names of manufacturers. No charge for this index. Address requests to DIESEL PROGRESS, 2 West 45th Street, New York 19, N. Y.

Third Army-Navy "E" to Briggs Clarifier

THE Briggs Clarifier Company recently received its third successive Army-Navy "E" award. The company feels strongly its responsibility in handling the Army and Navy contracts and will continue to provide the needs of the armed services.

Two brief ceremonies were held. In the morning of "presentation day," workers gathered in the new factory building to hear a short talk by a fellow employee, a veteran of recent air combat over Europe. In the afternoon, the ceremony was repeated at the business offices. At both gatherings, lapel pins were given to all employees entitled to wear them.

Ben Hunter Heads Honan-Crane Research

B. F. HUNTER has been named consulting engineer in charge of Research and Sales Engineering for the Honan-Crane Corporation, subsidiary of the Houdaille-Hershey Corporation, according to an announcement by C. R. Crooks, vice-president in charge of sales. Mr. Hunter assumed his duties with Honan-Crane January 1, after 19 years as chief lubrication engineer for the Gulf Oil Corporation and the Gulf Refining Company. For six years prior to his association with Gulf, he was chief industrial lubrication engineer for The Texas Company.

In addition to his status as consulting engineer, Mr. Hunter will also serve as chief of research. He comes to the Honan-Crane Corporation with a background rich in experience and a record of accomplishment which sets him high among the country's foremost lubrication engineers. Mr. Hunter will direct the research work in Honan-Crane's own laboratories, as well as special projects and more exhaustive inquiry in leading research institutes. Functioning also as head of sales engineering, he will make his wealth of experience available to Honan-Crane's Oil Purification engineers and his many friends in industry throughout the United States.

B. F. Hunter

Fluor Announces New Bulletin

COOLING Tower (Atmospheric Type) Bulletin: Contains data for calculating Cooling Tower sizes, essential points in Cooling Tower selection and details of construction and operation of Fluor Aerator Cooling Towers. Illustrated with photographs of typical installations, section drawings and performance charts; 20 pages. Available on request to The Fluor Corporation, Ltd., 2500 South Atlantic Boulevard, Los Angeles 11, California.

Lowell Thomas Tells the Story of Hercules

LOWELL THOMAS recently visited the Hercules Motors Corporation plant and in his inimitable manner has told the story of what he heard and saw there—a dynamic story interspersed with parallelisms drawn from the author's boundless reporting experiences. He traces the history of Hercules Motors beginning in the early days of World War I, through the intervening years to the part played by Hercules in the present war and then takes a look at the future. Lowell Thomas' story is presented in an unusually attractive brochure, interesting to read and valuable to have. A copy will be mailed on request to Hercules Motors Corporation, Canton 2, Ohio.

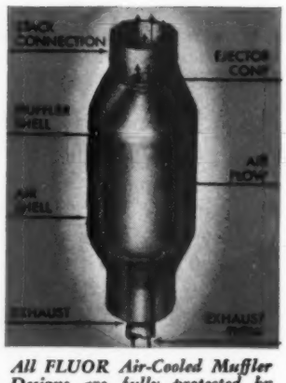
Morgan D. Douglas Elected General Motors Vice President

THE Board of Directors of General Motors Corporation has elected Morgan D. Douglas a vice president of the corporation. Mr. Douglas, whose appointment as general manager of the GMC Truck & Coach Division was previously announced was formerly general parts and accessories manager of the Chevrolet Motor Division and general manager of the General Motors Parts Division.

YOUR ENGINE EXHAUST IS WORTH MONEY!

It has been quite commonly accepted that engine exhaust is solely a waste product of combustion . . . something to dispose of . . . as quietly as possible. Hence—the conventional muffler is entirely a device to muffle exhaust noises.

This is an economic waste of a valuable source of energy . . . waste which is no longer necessary. FLUOR not only silences exhaust—it puts it to work with the Fluor *Air-Cooled* Muffler. If you really want to know how you can use your engine exhaust to ventilate, heat, or cool—investigate the Fluor Air-Cooled Muffler.



All FLUOR Air-Cooled Muffler Designs are fully protected by U. S. Patents & Patents Pending.

THE FLUOR CORPORATION, LTD., 2500 S. Atlantic Blvd., Los Angeles 22
NEW YORK • PITTSBURGH • KANSAS CITY • HOUSTON • TULSA

SINCE 1890

FLUOR

ENGINEERS • MANUFACTURERS • CONSTRUCTORS

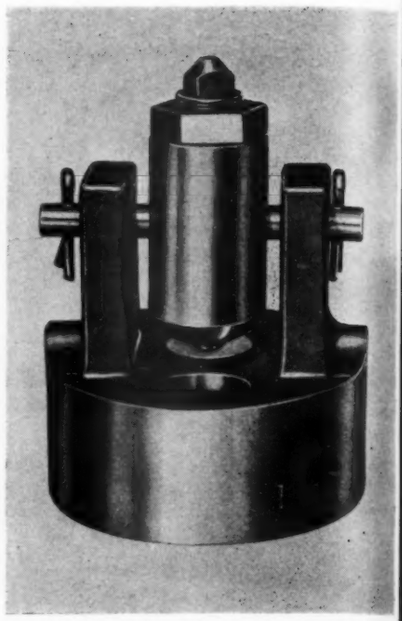
The Bearing Watchdog

PAXTON Diesel Engineering Company offers a new, thoroughly tested and approved automatic device to detect the wear or shell-out of the connecting-rod and main bearings of a Diesel engine. It has been thoroughly tested on leading railroads and affords inexpensive insurance against expensive crankshaft replacements and repairs.

This device consists of a "Watchdog" or trip-lever installed in the crankcase under each connecting-rod throw, a lug for each connecting-rod bearing cap, a dump-valve to be attached to the Serv-O-Motor of any standard hydraulic governor, a control box containing an air pressure reducing valve and tell-tale light, and copper tubing for connecting the various parts.

The Bearing Watchdog System is connected to the main air supply and under normal conditions a constant air pressure of ten pounds is maintained throughout the Watchdog System.

In the event a connecting-rod bearing or main bearing wears excessively or shells-out, the bearing cap lug strikes the Watchdog trip lever. This causes the release of the air pressure from the Watchdog system which actuates the dump-valve on the governor and effects an immediate shutdown of the engine and simultaneous lighting of the telltale light. The clearance between the Watchdog trip-lever and the lug on the connecting-rod bearing cap is set to represent the maximum amount of wear permissible (usually about .012 of an inch).



The Paxton Bearing "Watchdog"

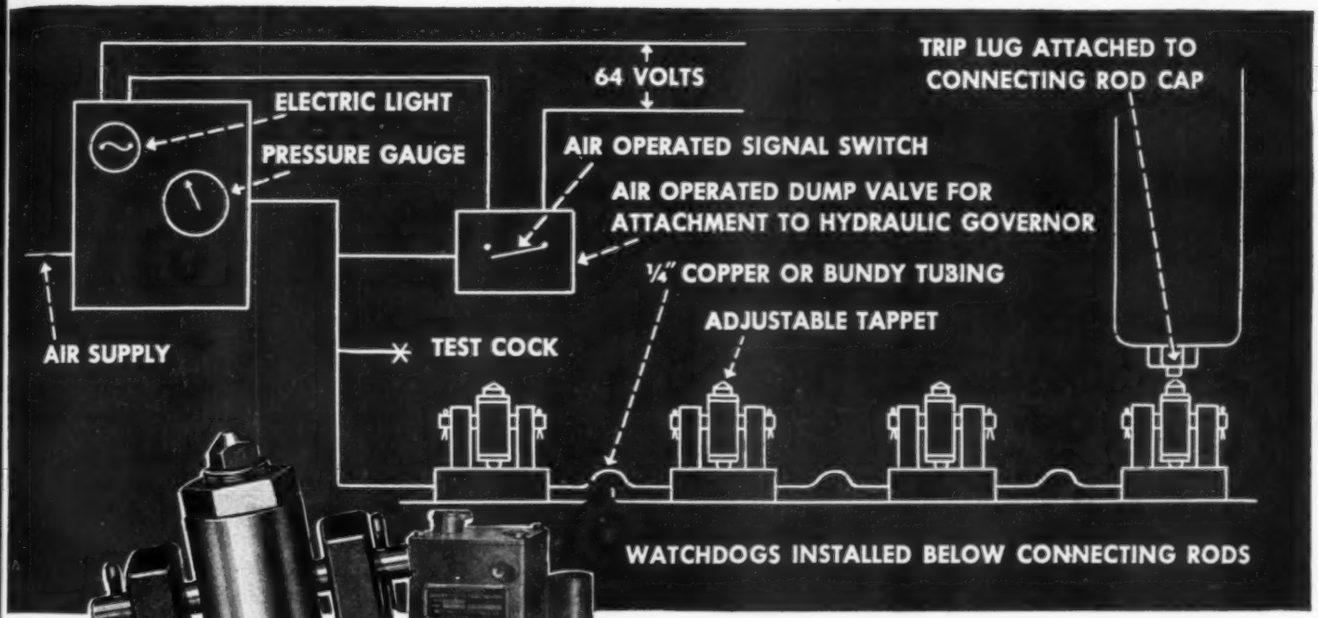
The Watchdog system also will shut down the engine if a main bearing goes out, because the crankshaft will flex sufficiently to trip the Watchdog. It also protects the engine in case of broken bearing caps, cap bolts or connecting-rods, as anything that releases the air pressure from the Watchdog system causes an almost instantaneous engine shutdown. Write for full particulars to Paxton Diesel Engineering Company, Omaha, Nebraska.

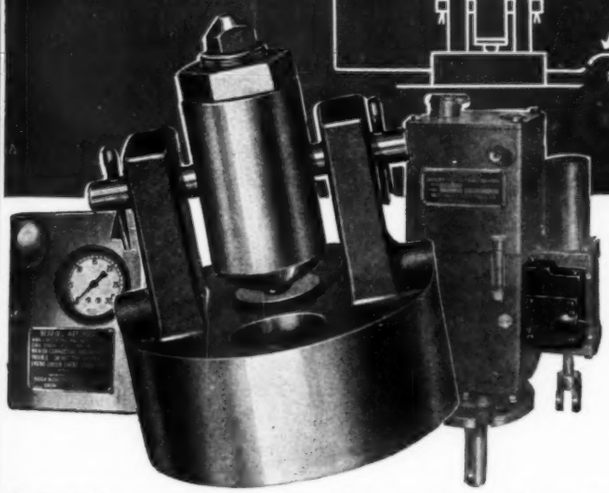
Blackmer Pump Company Appoints Representative For Mexico

JOSE MARIA FIERRO, who has been acting as Blackmer Representative in Mexico City and the adjoining districts, has been appointed General Representative for all of Mexico, effective January 1, 1945. Mr. Fierro has enlarged his selling activities and is building an organization which will adequately cover all of the major markets for rotary pumping equipment in Mexico. This announcement is made by J. B. Trotman, General Sales Manager of the company.

CUT DIESEL Maintenance COSTS!

with the BEARING WATCHDOG . . . Crankshaft Protector





- **Protects The Crankshaft**
- **Permits Maximum Bearing Wear**
- **Frequent Bearing Inspection Unnecessary**
- **Locates Faulty Bearing Instantly**
- **Simple . . . Positive . . . Low Maintenance**
- **Pneumatically Operated**
- **Protects The Engine**

By installing the Bearing Watchdog System, wear beyond predetermined standards, or shell-out of connecting-rod and main bearings on your Diesels can be detected in plenty of time to prevent damage to the crankshaft. Any bearing failure, broken connecting-rod bearing cap, cap bolt, or connecting-rod, will actuate the trip-lever resulting in engine shut-down within a few seconds.

The Bearing Watchdog System operates by compressed air from the main reservoir, through the Serv-O-Motor of any standard hydraulic governor. No electrical circuits or fluids enter the crankcase. The Bearing Watchdog System will save your company thousands of dollars and the loss of many hours operating time for your Diesel equipment.

This system has been thoroughly tested and proved on leading railroads and offers inexpensive insurance against expensive crankshaft repairs and replacements. Write today for detailed information.

paxton
DIESEL ENGINEERING COMPANY
2614 Martha Street
Omaha 5, Nebraska
DIESEL SPECIALTIES ★ PARTS ★ REPAIR SERVICE
A Subsidiary of PAXTON-MITCHELL COMPANY
Manufacturers of P-M Metallic Rod Packing

PAXTON DIESEL ENGINEERING COMPANY
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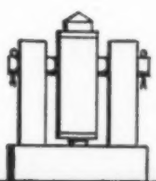


Install the

BEARING WATCHDOG SYSTEM
. . . IN YOUR DIESELS

We invite inquiries from Diesel Manufacturers and Diesel Designing Engineers

Engine Hour Meter

AN electrically operated engine hour meter for indicating hours, and accumulated number of hours, of operation for trucks, tractors, marine motors, any unit driven by Diesel or gasoline engines, and for use by laboratories or on testing work, has just been announced by the John W. Hobbs Corporation.

The hours of operation are indicated by three hands. One af these hands turns one complete revolution in 100 hours, the second, one revolution in 1,000 hours, and the third, one revolution in 10,000 hours.

Easily mounted on the instrument panel, the engine hour meter operates through the ignition switch, or by use of a special pressure switch. Available in D.C. in ranges from 6 to 115 volts; in A.C. in 110 v., 60 cycle and 220 v., 60 cycle operation. It measures approximately 2⅞ in. x 2½ in.

The Hobbs Engine Hour Meter

This instrument is supplied as standard equipment on various tractors, and practically all tanks and combat vehicles for the U. S. Armed Forces. Catalogue sheet will be sent upon request to John W. Hobbs Corporation, 2000 Yale Boulevard, Springfield, Illinois.

Five Stars Adorn Maritime "M" Flag of Cooper-Bessemer Corporation

MOUNT VERNON, O., Jan. 16—Five gold stars now proudly grace The Cooper-Bessemer Corporation's Maritime Commission "M" Burgee, indicating the success of this company's efforts to meet government wartime demands for critically-needed Diesel engines and parts.

Award of the fifth gold star was announced to employees by B. B. Williams ,chairman of the board, following its receipt from Washington. Mr. Williams admonished Cooper-Bessemer employees "to continue your program of furnishing our men on the front lines with what it takes and on time, and especially now when there is so much talk of shortages on the production front."

Cooper-Bessemer received the "Maritime 'M'" burgee on December 18, 1942, and each of the five gold stars it bears have been awarded at regular intervals ever since. These stars are awarded in recognition of a continuation of outstanding war production which merited the initial honor.

"The Cooper-Bessemer Corporation is particularly gratified to receive its fifth gold star at this time," said Mr. Williams in commenting on the award, "because it stands as an indication to our loyal employees that the government recognizes the sacrifice and extra effort which they have put forward to meet exceedingly difficult production schedules in the face of labor, material and other shortages. We have every reason to believe that these efforts will continue in full force until victory is achieved."

Fairbanks-Morse Changes

R. H. MORSE, Jr., General Sales Manager, Fairbanks, Morse & Co., Chicago, has recently announced the appointment of Clarence M. Bence as Diesel Department Manager of the company's Atlanta Branch and George S. Thompson as Manager of the Stationary Diesel Department of their New York City Branch House. Both men have served the company for some time.

Mr. Bence joined the Fairbanks-Morse St. Louis Branch organization as assistant in the machinery department following his graduation from Iowa State College in 1922. Later he became a field engineer located at Tulsa, Oklahome. For the past several years he has been technical assistant to the General Diesel Sales Division at the Chicago headquarters' office of the company.

Mr. Thompson started with the Fairbanks-Morse Company in 1908 and has had wide and varied experience handling all the many lines which the company manufactures with the exception of scales. For some time he has been assistant in the Stationary Diesel Engine Department of the New York Branch and his recent advancement to the head of that department is a tribute to his ability.

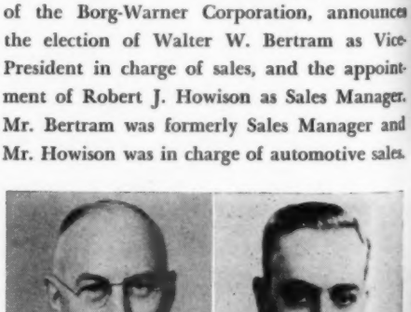
George S. Thompson and Clarence M. Bence

Burke Wins Army-Navy "E"

THE Burke Electric Company plant and personnel were recently awarded the "E" in a ceremony attended by employees and Army and Navy officials. Captain Harry Langley Pence, U. S. Navy (Retired) made the presentation address. The citation was made by Secretary of the Navy, James Forrestal. Burke is producing motors and generators for all types of fighting and merchant marine ships. The Company also pioneered in the design of a small portable hand generator and is producing them by the thousands for Allied use in conjunction with most leading radio manufacturers. The Burke Electric Company since 1891 has contributed many new developments in electric generation aboard U. S. Navy ships.

Morse Chain Announces Executive Changes

FOLLOWING a recent meeting of the Board of Directors, Morse Chain Company, Division of the Borg-Warner Corporation, announces the election of Walter W. Bertram as Vice-President in charge of sales, and the appointment of Robert J. Howison as Sales Manager. Mr. Bertram was formerly Sales Manager and Mr. Howison was in charge of automotive sales.



Walter W. Bertram, Vice President, and Robert J. Howison, Sales Manager, Morse Chain Co.

... That ships can move Materiel-Munitions-Men

I AM PROUD TO FIGHT...

I began life as a 33,000 lb. white-hot billet of fine steel.

Forging Hammers and Presses, Heat-treating Furnaces, Machines and Men trained me down to fighting weight . . . around 10,000 lbs. ringside.

I drive Liberty Ships, Submarines, P-T Boats, the Diesels of War.

I am proud to fight for the United Nations . . .

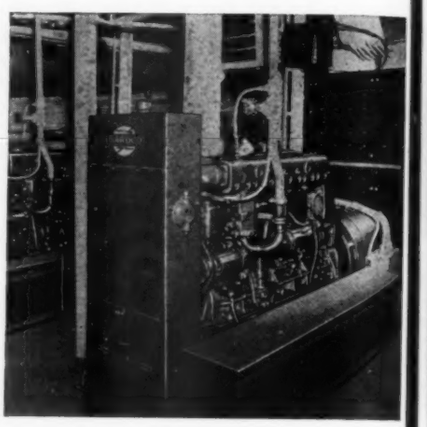
I was wrought, forged, seasoned and machined by expert designers, engineers and craftsmen at Erie Forge Company.

My counterparts..Shafting, Connecting Rods, Crankshafts, Steel Forgings and Castings..are good tough fighters for the battle of the Nations and for Industry.

ERIE FORGE COMPANY, ERIE, PA.

Diesel-electric Sets for Army Tugs

CHOSEN by the U. S. Army to supply electric power on a group of new harbor tugs, the Bardco Diesel generating plant is being installed on the vessels now under construction at the A. E. Long Yard at Olympia, Washington, and Birchfield Boiler and Shipbuilding Inc., Tacoma. Two of the plants are being placed on each ship. These installations are part of widespread use of the new Bardco single-bearing Diesel generating plants on shipboard and in industry, hundreds having been shipped in recent months to government and private purchasers.

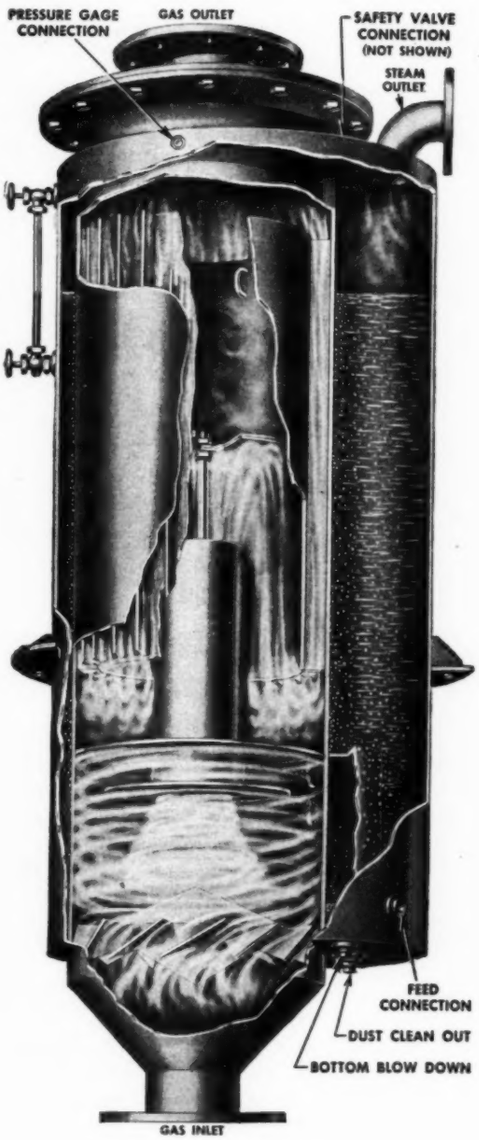


A pair of Bardco generating units using Chrysler Diesels are installed in new Army harbor tugs.

Bardco Manufacturing & Sales Company, of Los Angeles and Dayton, originally designed the plant for marine service, but is now producing it in both alternating and direct current models as a versatile general purpose marine and industrial generator. The Army tug installations, the direct current models, have a compound-wound, ABS drip-proof generator and a compact self-contained fresh water cooling system that replaces the usual radiator. Heat exchanger, make-up tank, and gear-type raw water pump are efficiently grouped together in the system to take up a minimum of space. A spare parts and tool compartment is handily located at the bottom of the sheet steel cabinet housing the cooling system. Power to drive the Bardco generators is supplied by a 6-cylinder Chrysler Diesel engine.

Both the Bardco DD40 and DA40 (the latter for alternating current) are rated at 40 kw. for continuous service. They operate at 1800 rpm. Bardco automatic safety controls stops the plants when water temperature or oil pressure reach the danger levels. The sets are equipped with a 24-volt starting system, and an electric air-preheater for starting in cold weather.

Now...a degree of B.T.U. heat recovery heretofore thought impractical



with the VORTEX HEAT RECOVERY SILENCER

FOR INDUSTRIAL AND MARINE DIESELS

Here, we believe, is the most advanced heat recovery silencer yet designed . . . the result of extensive study, precise engineering and many full-scale tests under extreme operating conditions.

In its primary function as an exhaust muffler, the VORTEX HEAT RECOVERY SILENCER is the equal of the famous VORTEX SPARK-ARRESTER SILENCER, achieving a high degree of silencing and carbon entrapment without the high back pressures encountered in other types of waste heat mufflers.

Over and above this, the VORTEX HEAT RECOVERY SILENCER generates steam from zero to better than 1 lb. per brake horsepower per hour at an engine exhaust temperature of approximately 550° F. and a boiler pressure of 15 lbs. gauge. At higher exhaust temperatures, the steam rate is correspondingly higher.

Should hot water be preferred, it is produced at a similarly high rate of efficiency.

Installation of the VORTEX HEAT RECOVERY SILENCER, in many instances does not require any more space than is usually needed for a spark-arrester silencer.

As the operator of a Diesel power plant where there is also use for steam or hot water, we suggest that you investigate further these advantages of the VORTEX HEAT RECOVERY SILENCER, submitting specifications* to us for estimate. Naturally, this involves no obligation.

**Data Needed:* Engine make and model; Rated BHP and RPM; Bore and stroke; 2 or 4 cycle; Exhaust pipe size; Exhaust Temperature; Hot gas volume, if any.

WRITE FOR NEW DESCRIPTIVE BULLETIN NO. 732

Engineering Specialties Co., Inc.

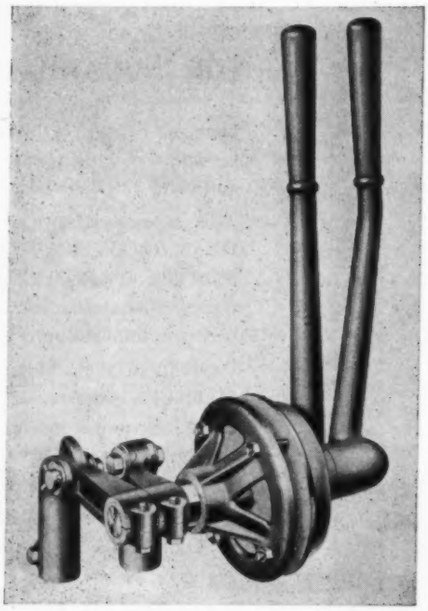
39 CORTLANDT STREET • NEW YORK 7, N. Y.

Manufacturers of

VORTEX SILENCERS *(wet or dry types)* • VORTEX SPARK ARRESTERS • VORTEX SPARK-ARRESTER SILENCERS
VORTEX DUST CATCHERS • VORTEX STEAM SEPARATORS *(Internal and line types)*

Marine Products Developments

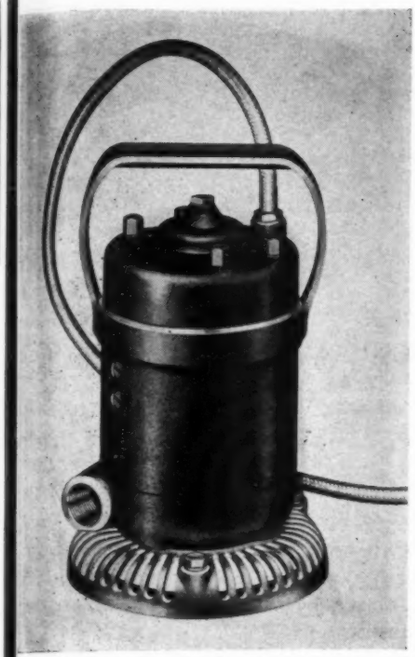
THE growing line of marine engineered equipment originated and manufactured by Marine Products Company now includes single and double controls for clutch and reverse gear; an ingenious combination control for throttle and reverse gear; single and twin throttle controls with finger-tip action, self locking; Thermovalve, a device for control of engine temperature; a new electric bilge pump operating on 12, 24, 32 or 110 volts; and the well known line of M-P centrifugal pumps, now built in five sizes, either rotation, for operation under 3600 rpm., with capacities of 30 to 385 gallons per minute.



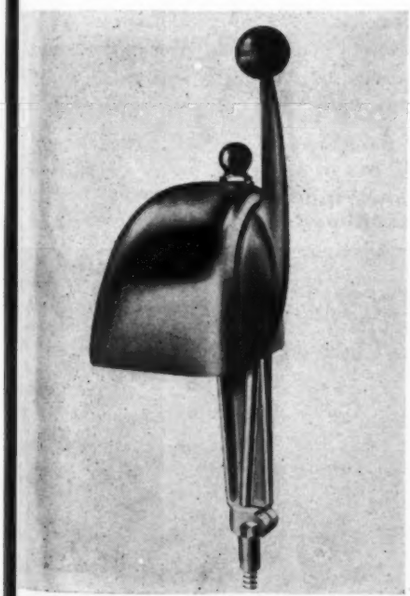
The clutch controls developed by Marine Products Company have many interesting features. Note adjustable flange mountings for easy installation: these have long bearings for firm support of control shaft without binding. Serrations on shaft permit setting drag links in any desired position with relation to control handle. Twin engine unit is illustrated; also built in a single unit.

Over 100,000 of the M-P centrifugal pumps have now been shipped to the U. S. Navy and U. S. Army, for use in amphibious craft. These and other M-P accessories are finding an increasing usefulness in the commercial field, and they are being currently shipped on regular priorities.

This engineering firm, specializing exclusively in the marine field, maintains a large experimental laboratory as a separate unit from its production division. The equipment described above, and other accessories now in development for later release, will be distributed by supply houses in leading marine centers.



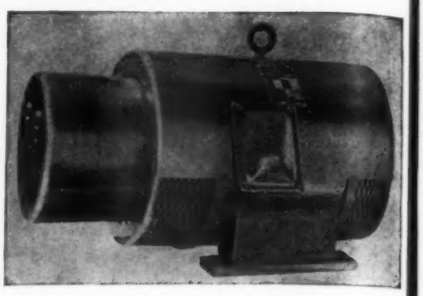
This electric bilge pump, developed by Marine Products Company, is now being supplied on government contracts for use in amphibious craft. It is also available for commercial work boats and fishing vessels on priorities of AA-5 or better.



One of the interesting new accessories is the remarkable throttle control manufactured by Marine Products Company. The feature of this unique control is that the operating lever has a velvety, finger-tip action, yet no vibration or force exerted on the engine side can move the throttle from its set position.

BUY MORE BONDS

New Small, A-C Generators



Revolving field type AC generator.

A NEW line of small a-c generators, of the revolving field type, has been announced by the Electric Machinery Mfg. Company. Built in ratings 6.25 kva., 1800 rpm. and 1200 rpm. to 18.7 kva., 1800 rpm.; single and 3 phase; standard and close regulation; 120, 120/208, 240 and 600 volts; these generators can be supplied as 2-bearing units for belted or coupled duty, or single-bearing for close coupling to driving engine. Dripproof generator and exciter construction is standard.

1944 DIESEL PROGRESS Editorial Index

A COMPLETE index of all editorial material which appeared in the 1944 issues of DIESEL PROGRESS is now available. Included is a cross index of authors and articles. Feature articles are covered by title; news notes are indexed by names of manufacturers. No charge for this index. Address requests to DIESEL PROGRESS, 2 West 45th Street, New York 19, N. Y.

New "Quality Control" Handbook

The handbook "Quality Control" belongs in every metal working plant library.

"QUALITY Control" is the title of the new pocket size handbook on scientific inspection which has just been released by Continental Machines, Inc., manufacturers of precision measuring instruments.

This new case-bound handbook is exclusive and unique in its concise explanation of scientific inspection through controls offered by precision measuring instruments. The use of over 200 photographs, diagrams, charts, and tables make the explanation of scientific inspection interesting, absorbing, and informative. Of great interest are the many conversion tables and measuring data which give pertinent information for the precision measuring methods required in scientific inspection.

One section contains thirty-five subjects vital to quality control which are highlighted with examples showing how to use the precision measuring instruments. Among the precision instruments and methods shown for quality control are the new mobile inspection units, sine bars, vernier gages, optical flats, Comparator gages, etc. Another section of the book contains sixty-four key questions, along with their answers which serve both as a check and test of the knowledge gained by the reader in studying this handbook.

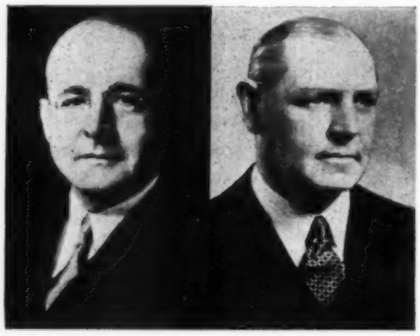
The book is dedicated to Eli Whitney, the father of mass production, whose invention for interchangeability of parts has become highly developed through the use of precision measuring instruments to interpret fine dimensions. These measuring instruments are pictured, showing their use in everyday production, safeguarding that production from rejects by establishing uniform control throughout the whole production set-up. Gage blocks, a host of Gage Instruments, and accessories are described, including presentation of the new Mobile Inspection Unit which brings the inspection department right to the point of work.

Any one reading the book's 140 pages cannot help but have a working knowledge of "Quality Control" as it should be used in modern production. As such, the book will be of particular value to plant inspection departments checking new ways to establish quality control over their products.

Supplementary information in the form of films, charts, etc. are offered in the book as further training aids on scientific inspection which can be secured by writing Continental Machines, Inc., 1301 Washington Avenue South, Minneapolis 4, Minnesota.

Worthington Executive Elections

THE Board of Directors of Worthington Pump and Machinery Corporation has elected Clarence E. Searle president of the corporation, to succeed Harry C. Beaver who was elected vice chairman of the Board of Directors, and chairman of Management Committee. Mr. Beaver has been president of the corporation since 1931, and Mr. Searle has been vice president in charge of sales since joining the Worthington organization in 1932, following a long period of service in various executive capacities with the Allis-Chalmers Manufacturing Company of Milwaukee, Wisconsin.



Clarence E. Searle, president and Hobart C. Ramsey, vice president, Worthington Pump and Machinery Corporation.

Hobart C. Ramsey, vice president in charge of operations, was elected executive vice president. Edwin J. Schwanhausser, vice president in charge of the corporation's manufacturing and sales operations in Buffalo, was elected vice president in charge of sales. Leslie C. Ricketts, manager of the corporation's Harrison Works, was elected a vice president. These elections became effective January 1.

New Gas Engine Cuts Fuel Consumption

A DISCOVERY in the Diesel engine field, which will enable the engine operator to use either gas or oil as fuel without any electrical sparking device, and will cut fuel consumption of gas engines by from 20 to 25 per cent, is announced by Ralph L. Boyer, chief engineer of The Cooper-Bessemer Corporation, Diesel manufacturers.

Mr. Boyer said that the new discovery is the result of experimentation which began in 1928. Recently efforts have been rewarded by the successful operation of a natural gas engine on the Diesel principle. This enables the unit to operate on a wide variety of fuels including fuel oil, natural gas, manufactured and coke oven gases, sewage gas, and refinery by-products.

The conversion from liquid to gas fuel is as simple as the closing of one valve and the opening of another with the engine operating continuously at full load. Although conversion from one fuel to another has been possible in the past, it has always been necessary to shut down and exchange major or minor parts of the engine. The new principle will enable the engine to have the same fuel economy regardless of the type of fuel used. It raises the normal 25 per cent thermo-efficiency of the gas engine to the 35 per cent thermal-efficiency common in Diesel oil engines.

Several times since 1928, Mr. Boyer said, engineers in the Diesel field thought they had the answer to the multi-fuel conversion problem but in the past it has been thought necessary to inject the gas under high pressure of from 1200 to 1500 pounds. This involved complications which overcame the advantages obtained. The new Cooper-Bessemer development makes possible the use of gas at normal pressure and the change from one fuel to another without the necessity of a shut-down.

The discovery is considered to be particularly important to the operation of modern long distance pipe lines. Many of these lines have from 100,000 to 150,000 horsepower of gas engines installed along their length to drive the compressors or pumps. The total fuel used by these engines for 150,000 horsepower would amount to 36,000,000 cubic feet of gas per day, which is about one-third of a single day's total consumption of a city with a population of a million.

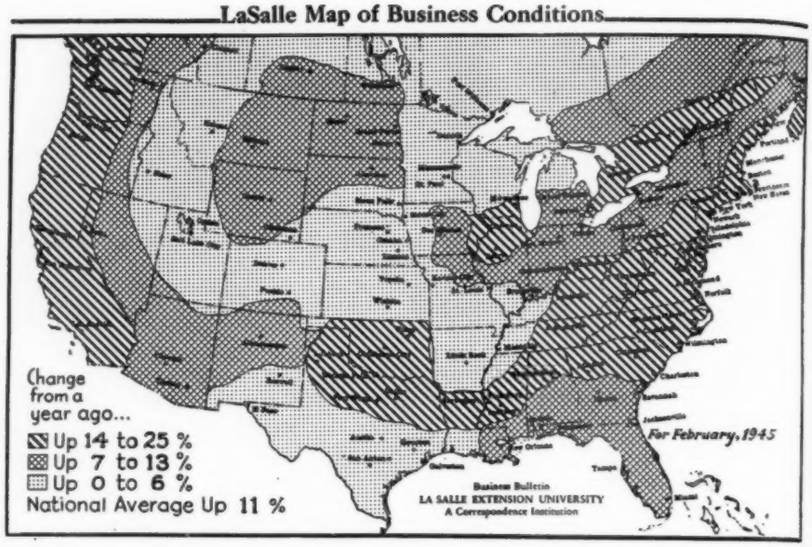
When operating as gas engines, it is stated, these new gas Diesels would save from 5,000,000 to 6,000,000 cubic feet of gas for domestic and industrial consumption per day. If the engines are converted to oil fuel the total fuel consumption of 36,000,000 cubic feet of gas could be made available for consumer use.

The Cooper-Bessemer Corporation already has engines embodying the new principle in production along with its standard line of marine and stationary engines and standard compressor units. In addition to the convertibility feature and the possible fuel saving, it is pointed out, the new development in Diesel operation will mean the elimination of one of the greatest fire and explosion hazards in the gasoline refining industry because there will be no necessity for using any ignition or sparking device.

Farr Company Gets "E" Award

AWARD of the coveted Army-Navy "E" to the

LaSalle Map of Business Conditions



Business Activity Is 11 Per Cent Higher Than a Year Ago

Map Supplied by BUSINESS BULLETIN DIVISION of La Salle

The volume of trade and industry continues to hold up well and in many places is rising gradually after some slackening in production a few months ago. The rate of business activity is about 11 per cent higher than it was a year ago but the recent increases have been somewhat less than they were during the early months of last year. Current indications are that during the next few months conditions will remain about as they are now and that high levels will be maintained as long as war continues.

Not only is the general average of all business relatively stable, but also the variations among different industries and in different parts of the country are somewhat less than they were a few months ago, when many plants were expecting to reconvert to peacetime production soon. Now the emphasis on maximum war production is keeping total production everywhere as high as capacity and available labor will permit.

The LaSalle Map of Business Conditions does indicate, however, some significant facts about activity throughout the United States and Canada. The areas of greatest expansion are along both the Atlantic and Pacific Coasts, throughout much of the South, and in various spots of the industrial Middle West. The fact that these areas show the greatest gains over last year is doubly significant because they were the places where business was high a year ago. War plant capacities have not been expanded so much in recent months, but evidently the plants are operating even more efficiently with slightly fewer employees.

Business conditions in the agricultural regions are better than they have been for many years but they have not improved quite so much as in other regions. In spite of record crops and farm income last year, business in rural areas is lagging somewhat. One exception is in parts of the South and in the Northwest. In the Southwest, activity is high, due partly to the record production in the oil fields. Farming areas in which livestock is predominant are making a slightly less favorable showing than are those where income is more closely related to crop production.

Business volume in New York and other Atlantic seaport cities has increased much more than the national average. One significant factor in pushing business upward in those places is the large quantities of goods which are being shipped to supply the military forces and for lend-lease to our allies. Foreign trade is at peak levels and the handling of it stimulates business not only among the manufacturers who make the goods, but also among the transportation agencies which handle them.

In Canada the volume of trade and industry is increasing at about the same rate as in the United States. Gains have been greatest in the industrial region north of the Great Lakes, in the East, and along the Pacific coast. In every section, business is higher than it was a year ago and indications are that it will remain at least at the present levels for many months. Demand from domestic consumers and from foreign buyers is unusually large and is stimulating business in all lines.

Farr Company has just been announced by the Western District headquarters of the Air Technical Service Command. War production activities of the firm have been concerned chiefly with the manufacture of Farr Carburetor Air Filters for airplanes.

In connection with the award it was announced that in three years production had tripled. As a result one out of every three airplanes produced is equipped with Farr Carburetor Air Filters.

1944 DIESEL PROGRESS Editorial Index

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West Coast Diesel News

By JIM MEDFORD

LAUNCHED by Hodgson-Greene-Haldeman, Long Beach, California, the 116-foot *United Victory* has a 6 cylinder, 450 hp., direct reversing Enterprise Diesel turning 333 rpm.; Caterpillar Diesel auxiliaries, General Electric generators, Fairbanks-Morse pumps and motors.

ANOTHER Gray Marine Diesel sale by Thompson Machine Works, was a 110 hp., 4 cylinder engine with 3 to 1 Twin Disc reduction gears to Dan Burtchell of Crescent City, California, for fishing boat propulsion.

CONVERTED from steam, the 110-foot tug MS *P. W.* of the B. C. Packers fleet, Vancouver, B. C., is getting a new 320 hp. Fairbanks-Morse main engine, F-M Diesel auxiliary, Buda Diesel auxiliary and Ingersoll-Rand cargo hoists.

FISHING for the Van Camp Sea Food Co., Terminal Island, California, Nick Dragich has taken delivery of his new purse seiner *Plover* powered with a 400 hp. Atlas Imperial Diesel.

ALL Atlas Imperial Diesel engined, the 98-foot, Al Larson-built tuna clipper *American Lady* for San Diego owners has 400 hp. main engine, two 120 hp. auxiliaries with 94 kva. G-E generators.

O. J. RILEY'S portable oil rig now in Ventura county, California, is using a pair of 260 hp., 8-cylinder Superior Diesels with a fuel cost of $12.50 per day on deep well drilling. Pumps are Gardner-Denver.

OF the unusual Monterey type hull, the 36-foot *Lorraine* of San Diego, California, will have a 40 hp. Caterpillar Diesel. There are

Twin Disc gears and 1½-ton refrigeration. For a 36-footer, "that's a boat," says owner Ed Hollinger.

BUILT by Schulte Boat Works, Gardner, Oregon, the 67-foot tunaman for Van Camp Sea Food Co., has a V-8 Caterpillar Diesel, Twin Disc gears and Lambie wheel. Speed is 8½ knots on trial run.

POWERED with a pair of 175 hp. at 800 rpm. Cummins Diesels, Kirkland Marine Construction yard at Seattle, Washington, for Raymond and Hall, Newport, Oregon, the 70-foot *Christian,* live bait boat, has Twin Disc gears and power takeoff.

ALSO at the Kirkland Shipyards there has been completed the 70-foot fishing vessel *Fortress* for Herm Jorgenson. This craft is powered with a 155 hp. Atlas Imperial Diesel.

PREFABRICATED passenger ferries are appearing on Puget Sound, Washington. Capacity is 500 passengers; hull is of prefabricated steel, plywood deckhouses and powered with twin Gray Marine 100 hp. Diesels.

ON the Columbia River, Oregon, the Portland Tug and Barge Company's tug *Hilda* is getting her face lifted and a new 320 hp. Fairbanks-Morse Diesel at the same time replacing one of 160 hp.

AND it's Atlas Imperial Diesel for the new *Cecilia,* a 61-foot dragger for the Castagnola Sea Food of Santa Barbara, California. Built at Newport Harbor, the 1155 hp. engine turns 350 rpm.

STEPHENS Bros., oldest boat builders in Stockton, California, have completed several 50-foot Army salvage tugs all powered with 200 hp. Buda Diesels, and, incidentally, now fly the coveted Army-Navy "E."

THE Crofton yard, San Diego, California, have completed the installation of a new 80 hp. Gray Marine Diesel in the 55-foot albacore boat *Admiral.* The reduction gears are Twin Disc.

ADVERTISERS' INDEX